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THE AMERICAN
# JOURNAL OF PHARMACY

VOL. 95. JANUARY, 1923. No. 1.

## EDITORIAL

### RING OUT THE OLD; RING IN THE NEW.

Spring, Summer, Autumn, Winter,—flower showers, burning sun-gold, harvest moon, drifting snowflakes—and nineteen twenty-two fades out, its promised program ended. Another atom of time-spent fuses into the vastness of eternity. Indeed the spacious record of Chronos is little altered for all the mark that this old year has left upon its scroll; but in the lives of many sons of men is writ in letters large its lasting impress.

There were those who set the months to music and the days to living dreams. To them the speeding seasons only carried each its song. Happy hearts and happy homes. They sensed the everlasting promise, "for how the heart is, home is." And in their own protected vaults is stored the year's most cherished memories. Tomorrow to them brings proof of wise investments, for only time sweet-spent brings gladsome dividends.

To others, less fortunate in heart and happenings, the lost year drags out and leaves no blessed memories. For through its span there came to them but little joy and comfort. Flowers of the Springtime served only to adorn a lost friend's shroud; the glorious sun of Summer only withered fond ambitions; Autumn harvest gleaned the last-loved child to home and rest, and Winter came distressful with only frost to chill the heart and flakes of snow to hide the little grave mound.

But sad or glad, gone forever is the year. And now—Ring out the Old, Ring in the New. For yesterday is gone—completely gone—today we face tomorrow. Memories, sad or glad, please only part of

life's great plan. Rather it is Faith in Today and Hope for Tomorrow that warms the heart and grants the soul its sustenance. Faith in the work, the aims, the ideals of today and Hope in the rest, the achievements, the rewards of Tomorrow.

> "We live in deeds not years, in thoughts not breaths;
> In feelings, not in figures on a dial.
> We should count time by heart-throbs, He most lives
> Who thinks most, feels the noblest, acts the best.
> Life's but a means unto an end; that end
> Beginning, mean, and end to all things,—God."

And so with happiness and with hope we again extend to a wide circle of readers and friends our honest good wishes for the year that comes so clean and new—1923.

With grateful acknowledgment to those who displayed a kindly interest in our aims and endeavors, and who helped to make the JOURNAL readable and worth-while, we pledge ourselves anew to keep it in the serviceable place which it has long since filled with honor and with credit.

I. G.

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## THE WORK OF THE COUNCIL ON PHARMACY AND CHEMISTRY OF THE AMERICAN MEDICAL ASSOCIATION.

In 1905 the American Medical Association established a form of scientific service in the work of its "Council on Pharmacy and Chemistry," which was designed primarily for the purpose of collecting and distributing information regarding proprietary medicinal articles.

The council consists of a group of sixteen members, fifteen appointed for five year terms without remuneration, and a full time secretary, who is also the Director of the Chemical Laboratory of the American Medical Association.

As originally constituted the council was composed of a few members whose education and training had been entirely pharmaceutical and a few members who should be classed as chemists. The remaining members consisted of pharmacologists, bacteriologists and teachers and practitioners of medicine, the latter predominating.

At present there is only one member of the committee (the secretary) whose education and training were solely pharmaceutical, and three who may be primarily classed as chemists.

The work of this organization has been very comprehensive and thorough. Out of it has grown the annual publication of a book called "New and Non-Official Remedies," in which are described such proprietary articles and non-official substances as appear to be of sufficient importance to warrant their inclusion, and which comply with the stringent rules adopted for the guidance of the council concerning admissions.

This book is valuable both to the pharmacist and the physician supplementing and anticipating, as it does, the United States Pharmacopœia, of which it might be aptly called the "proving ground."

The council also publishes several other annual volumes, including "Reports of the Council on Pharmacy and Chemistry," which concerns itself with the discussion of proprietary medicines which have been found inadmissible to new and non-official remedies, and "Laboratory Reports," in which are described in detail the methods of analysis employed and other interesting data.

Other valuable volumes growing out of the work of the council are "Nostrums and Quackery" (two volumes), and "The Propaganda for Reform in Proprietary Medicines."

The council has never been supported in its work with enthusiasm by either the pharmaceutical or the medical profession. It has created many enemies by the consistent course it has followed of applying the rules of scientific evidence to all claims for composition and therapeutic value. Sometimes the attitude of the council has been dogmatic rather than judicial, but it has pursued its course without fear or favor and has done for pharmacy what pharmacy has not had the temerity to do for itself and for medicine it has accomplished results that are neither comprehended nor appreciated by the great majority of active practitioners.

This antagonism and this lack of appreciation are probably due to the existence of a condition aptly described by Dr. Edward Martin, Health Commissioner of Pennsylvania, in accounting for the lack of co-operation in health work on the part of his fellow-physicians, and which applies to pharmacists with equal force. He said: "The profession of medicine is made up of three groups: An upper

third—leaders in research, thought and helpful action, self-immolating altruists, the flower of civilization; a middle third—strong, able, clear-minded men, who follow the lead of the upper third; and a lower third—prejudiced, ignorant, self-centered, whose approbation is undesirable."

If every pharmacist and every physician would spend sufficient time to familiarize himself with the literature referred to, and if every pharmaceutical and medical college possessed a complete list of these publications and required the students to become conversant with their contents, the practice of pharmacy, and of medicine, too, would be markedly benefited within a short time.

The council is doing pioneer work in the interests of professional ethics. Let us honor it for the good that it has accomplished, for it has borne our burden and assumed our responsibilities and thus deprived us of the right to be over-critical.

C. H. L.

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# ORIGINAL ARTICLES

## A CHEMICAL EXAMINATION OF A VENEZUELAN JABORANDI.[1]

**By O. F. Black, J. W. Kelly and W. W. Stockberger.**

A species of *Pilocarpus* occurs in northwestern Venezuela which is locally known as "borrachera" on account of its intoxicating effect upon animals which have eaten the leaves of this plant. Ernst,[2] who published a brief note on this species in 1883, gave Dr. J. Freites of Barquisimeto as his authority for the following statement regarding the plant and its effect upon animals: "This shrub grows in dry and hot localities in the vicinity of Barquisimeto; it sends up from the ground several shoots which grow to a height of one and one-

[1] Contribution from the office of Drug, Poisonous, and Oil Plant Investigations, Bureau of Plant Industry, U. S. Department of Agriculture.

[2] Ernst, A. Un Jaborandi Venezulano. *El Ensayo Medico,* Vol. 1, No. 8 pp. 61-62. Caracas, 1883.

half to two meters. It causes in animals which eat it, a sort of intoxication or drunkenness from which the plant derives its name; also it induces profuse perspiration and salivation."

Specimens of the plant received by Ernst from Barquisimeto were provisionally determined by him as *Pilocarpus heterophyllus* A. Gray, a species which was discovered about 1857 by Wright[3] in Cuba. Early in 1922 the writers received from Dr. H. Pittier, Director of the Commercial Museum at Caracas, a quantity of leaves of the borrachera with the comment that a careful study of the plant had led him to consider it a new species of *Pilocarpus*, the name for which unfortunately he has not yet published. The relationship of this Venezuelan Jaborandi to the official species of *Pilocarpus* at once suggested that it might contain pilocarpine or some of the other alkaloids which occur in this group of plants. A study of the material received from Dr. Pittier, which consisted of about five pounds of well preserved leaves, was therefore undertaken to determine what active principles were present.

A preliminary test of a small quantity of leaves macerated in Prolius' solution gave a positive reaction for alkaloids. Next, 60 grams of leaves were coarsely ground, placed in a Soxhlet apparatus and exhausted successively with ether, chloroform, acetic ether, ethyl alcohol, and finally acidulated water. The chloroform, acetic ether, and alcohol fractions each gave a positive reaction for alkaloids, that of the alcohol fraction being the strongest. The acidulated water fraction gave no reaction, thus showing that the extraction of the alkaloid was complete before that solvent was applied.

Later 600 grams of finely powdered material was moistened with 95 per cent. alcohol containing 1 per cent. HCl, and percolated with 1 liter of acid alcohol, followed by 4 to 5 liters of neutral alcohol. The combined extract was neutralized with ammonia, concentrated to a small volume by distillation under reduced pressure, and the residue freed from the large amount of chlorophyl and other extractive matter present by treatment with successive portions of 1 per cent. HCl. About 1 liter of acid solution was thus obtained, which

[3] Grisebach, A. Plantae Wrightianae. *Memoirs Amer. Acad. Arts and Sciences*, n. s., Vol. 8, p. 170. 1861.

was neutralized with ammonia, concentrated in vacuuo to about 150 c. c., then made strongly alkaline with ammonia and shaken out with chloroform, eight portions being used, or about 250 c. c. in all. After this procedure the solution still gave an alkaloidal reaction. The chloroform was then distilled off, and the residue, dried in a desiccator, consisted of 1.49 grams of a brown amorphous mass, equivalent to 0.25 per cent. of the weight of the leaves extracted.

The crude alkaloid was treated with dilute HCl, which dissolved all but a slight quantity of the brown gum. The filtered solution was made strongly alkaline with ammonia and shaken out with $CHCl_3$, three extractions being sufficient to completely remove the alkaloid. The partly purified alkaloid was dissolved in a few c. c. of absolute alcohol made faintly acid by the addition of an alcoholic solution of nitric acid. After standing a short time crystals began to separate from the solution. These were allowed to grow for several hours and were then removed by filtration with suction and washed with alcohol and ether. The crystals, which were small, colorless prisms, weighed 0.22 grams, which is equivalent to about 0.04 per cent. of the weight of the leaves.

That this product is pilocarpine nitrate is proved by its crystalline form, the solubility of the free base in alkalies, its response to the ordinary tests for alkaloids, and its melting point, which was found to be 170° after one crystallization and 173° after a further recrystallization. Jowett [4] gives 176°-178° as the true melting point of the pure salt. It is quite probable that the product obtained in the laboratory contained some slight impurity which a further recrystallization would have removed.

Whether the leaves of the Venezuelan *Pilocarpus* can be used as a source of pilocarpine is doubtful since they do not compare favorably with either *Pilocarpus jaborandi* or *P. microphyllus* in alkaloidal content. The following table, adapted from Henry,[5] gives the principal facts known about a number of species of *Pilocarpus*, to which have been added the facts just recorded about the Venezuelan species.

[4] Jowett, H. A. D. The assay of preparations containing Pilocarpine and the characters of Pilocarpin nitrate and Hydrochloride. *Pharm. Journ.*, Vol. 63, pp. 91-93. 1899.

[5] Henry, T. A. The Plant Alkaloids, p. 302. 1913.

**Table I. Alkaloids in Different Species of Pilocarpus.**

| *Name.* | *Constituents.* | *Total Alkaloids* *Per cent.* | *Crystalline Pilocarpine Nitrate* *Per cent.* |
|---|---|---|---|
| Pernamubuco Jaborandi (*Pilocarpus jaborandi*) | Pilocarpine<br>iso-pilocarpine<br>Pilocarpidine | 0.72 | 0.67 |
| Paraguay Jaborandi (*Pilocarpus pennatifolius*) | Pilocarpine<br>iso-pilocarpine | 0.2 to 0.3 | —— |
| Marahan Jaborandi (*Pilocarpus microphyllus*) | Pilocarpine<br>iso-pilocarpine | 0.765 to 0.783 | —— |
| Guadeloupe Jaborandi (*Pilocarpus racemosa*) | Pilocarpine<br>iso-pilocarpine | —— | 0.45<br>0.12 |
| Ceara Jaborandi (*Pilocarpus trachylopus*) | Not known | 0.4 | |
| Aracati Jaborandi (*Pilocarpus spicatus*) | Ψ-Pilocarpine<br>Ψ-Jaborine | 0.16 | |
| Venezuelan Jaborandi (*Pilocarpus* n. sp.=P. *heterophyllus*) | Pilocarpine | 0.25 | 0.04 |

As shown by Jowett, the value of *Pilocarpus* as a drug depends chiefly upon its pilocarpine content, since the iso-pilocarpine and other alkaloids which have been identified are less powerful in their action. An examination of the table shows that the Venezuelan species has not only a much smaller percentage of total alkaloids than *Pilocarpus jaborandi,* but the percentage of pilocarpine is also very much less. However, it compares favorably with several of the other species in the series.

There is little reason to doubt that the poisonous effect of Venezuelan Jaborandi on livestock is due to the alkaloids present in this species since the symptoms recorded by Ernst are among those recognized as evidence of pilocarpine poisoning.

# THE STORY OF GLASS.*

By J. W. Sturmer.

Lecturer on Pharmaceutical and Industrial Chemistry, Dean of Science, Philadelphia College of Pharmacy and Science.

My first impression of a glass factory is still quite vivid. It was years ago, and in the natural gas belt of Indiana. The "works" were located in the open country, and our visit was in the late evening. From a distance we could see the big stacks silhouetted against the night sky. On approaching, we saw the sprawling buildings, brilliantly illuminated inside by the fires in the furnaces. Dark figures were passing to and fro, and to the tune of a weird chant. It seemed uncanny—spooky. Were they elves at play, as Rip Van Winkle saw them in the Catskills—or gnomes of Vulcan performing their rites in a modern temple of Keramaikos?—or humans engaged in some uncommon but prosaic tasks? As we came closer, and as the tune changed to "Annie Roonie" all illusion was dispelled, and we saw men and boys at work, grimy and perspiring, but singing at their toil and exhibiting marvelous skill, for here was in very fact one of the modern work shops of Vulcan, where by the aid of fire men made that transparent igneous rock called glass, which is so intimately associated with the scientific progress of modern times, and which has so fundamentally changed our habits of life.

## A Few Fragments of History

Our archeologists, engaged in uncovering very ancient Asiatic ruins, have looked in vain for articles made of glass. Pliny tells us a story of Phoenician merchants—or were they mariners?—who kindled a fire on a sandy beach, on the shore of Asia Minor, using blocks of nitre to build a rude fireplace, and who found in the ashes of their camp fire a transparent, glass-like substance. But the modern glass worker, knowing the high temperature required in the process of making the substance which we now classify as glass, and knowing the difficulty of attaining this high heat in an open camp fire, is forced to the conclusion that if Pliny's narrative has a basis in fact, the substance formed must have had a composition

*One of a Series of Popular Lectures delivered at the Philadelphia College of Pharmacy and Science.

quite different from that of modern glass. The ancient Egyptians, however, as early as 1600 B. C., did make glass beads and glass ornaments, and may have originated glass making, although students of ancient history are rather inclined to hold with Pliny that the discovery of glass happened in Syria.

As the art of glass making developed, glass vessels, such as amphoræ (bottles), drinking cups and vases, were made, and such specimens have been discovered in the tombs of Egypt. The first authentic example of ancient window glass was discovered in the ruins of Pompeii, and the panes were found still securely held in their frames of bronze. Strange to say, this Pompeian glass, on analysis, disclosed practically the same composition, not only qualitatively, but also quantitatively, as the common glass of present-day American manufacture.

But it should be remembered that the windows of very ancient architecture are merely openings, that during the Roman era, glass windows were used to a very limited extent; and that thin sheets of marble, and other translucent rock, were more commonly employed for the purpose. It is accordingly difficult to determine when the glass window, as we know it, came into use. Certainly it is hard to say when such windows became a common feature of dwelling houses. In England, during the Elizabethan period, glass windows were still confined to cathedrals, and to the castles of the nobility. A memorandum of the steward of the Duke of Northumberland, written in 1567—when Shakespeare was a three-year-old boy—suggests that the glass panes of the castle windows be taken out of their frames and stored in safety during the duke's absence, lest they be broken by the storms—a precautionary measure indicative of the rarity and costliness of window glass at that time. Indeed, windows of oiled paper, and of parchment, were still in general use in the latter part of the eighteenth century, even in the city of Paris.

It is interesting to contemplate to what extent the glass window has in recent times influenced the distribution of the human race. How it has played its part in determining the material progress and the industrial supremacy of the nations of the North. Their very modes of living have undergone a change, because of glass, for they have become house-dwellers, and the productivity of their workshops has become enhanced as glass windows made possible

activity throughout the year in many industries which formerly were seasonal, and were stopped by bad weather. Indeed, at the present time, the use of glass, in the construction of factories is still on the increase, and seemingly will continue to be until the conventional factory building will have become in very truth a house of glass.

In 1607 the first glass factory was established on American soil, and was located in the primeval forest, a mile from Jamestown. In 1683 glass making had its modest start in Philadelphia. There are now in operation throughout this country three hundred and sixty-odd glass factories, representing all branches of this important industry.

Glass making remained an empiric art for many centuries. Attempts to give it a scientific grounding began about a hundred years ago. In 1882, Abbe, Schott and others, entered upon their fruitful researches on the chemical composition of glass, and laid the foundation for the truly marvelous development at Jena, Germany, which resulted in the production of all kinds of optical glass, and of new types of glass for chemists' use.

The most conspicuous contribution of our country to the development of the industry has been along mechanical lines, and in the solving of engineering problems incident to mass production, although we must not forget that our glass chemists have kept abreast of progress, and that American chemical ware, window glass, and bottles, are equal to the finest products of Europe.

## Pottery and Glass

The making of pottery is one of the oldest of arts, and is intimately connected with glass making. History does not tell us—nor will it ever tell us—when man first noticed that the clay under his feet had been baked hard by the rays of the sun, and when, taking a hint from this observation, he first shaped rude domestic vessels out of moist clay and learned to make them more durable by baking them in a fire. All pottery making, to this day, involves shaping water-moist clay, drying and then baking, thus causing partial fusion, with the result that the unfused particles are cemented together. Articles of glass, on the other hand, are shaped from a product obtained in the molten condition, and which on cooling passes gradually through all phases of plasticity.

The predominating constituent of the material used for pottery is clay, while sand is the chief ingredient of the mixture which yields common glass.

How pottery and glass are connected in our story we shall see presently. But what *is* glass?

The chemistry of glass—indeed of ceramics generally—is built about the element silicon, an element constituting about one-fourth of the earth's crust, but which, because of its affinity for oxygen, is never found in the free state. Elementary or free silicon is a product of a laboratory process. For this reason, silicon was not very generally known until rather recently. It occurs as a brown or black, amorphous powder, or as a black, hard crystalline substance, having a melting point of about 2600° F.

Just as carbon is the keystone of the varied compounds found in the organic world—in compounds which make up vegetable and animal matter—so silicon is the keystone of the compounds of the soil. Sand is silicon dioxide; clay is aluminum silicate; most common rock materials are silicates; the granite boulder, carried to our latitude from its distant parent rock by the glacial drift, is mainly a mixture of silicates. Our food grows forth out of a soil of silicates. If we build our house upon the shifting sand, or build it upon solid rock, we build it, in either case, upon compounds of silicon—unless we happen upon an out-cropping of limestone, which, as is well known, is a carbonate.

And these two elements, carbon and silicon, are closely related chemically. Moreover, just as man has learned to make artificially many compounds of carbon which are not found in plants or in animal organisms, so man has learned to produce compounds of silicon which are not formed in nature's own laboratory.

## Glass

Glass is a man-made product—an artificial igneous rock. But like natural rock, it is made up of silicates, and differs from the composite rocks which we know in that the silicates have been fused together to a homogeneous product.

Glass is a generic term, for there are endless varieties, all differing in composition, and in their characteristics and uses.

Common glass is technically known as soda-lime glass, and is made by subjecting to a temperature of about 2000° F. a mixture of

sand and lime, or limestone, and soda ash, which is the name given to partially dehydrated washing soda. Let us examine these substances more closely.

### The Silica

Sand, as has been stated, is silica, or silicon dioxide, $SiO_2$, of course contaminated more or less with impurities. If sand be heated in an electric furnace to a temperature of about 3500° F., it will become plastic and cohesive, and may be formed into evaporating dishes, crucibles, or tubing. Such ware now finds extensive use in chemical laboratories, because of its heat-resisting, and heat-shock-resisting properties, and because of its being practically insoluble. The larger articles of silica ware are white or nearly so, opaque, and with a silky lustre, which is due to the imprisonment of countless minute bubbles of air. Complete fusion expels these bubbles and renders the silica transparent. Silica ware, particularly the transparent variety, is also called quartz glass; and when, on prolonged heating, this colloidal silica crystallizes, and loses its homogeneity, we say it de-vitrifies, which means that it loses its glass-like character. Popularly, however, silica ware would not be classified as glass ware.

### The Lime

If the lime be subjected to intense heat, it becomes incandescent. It does not, however, fuse at the temperature attainable by furnace fires, as its melting point is above 4500° F. So we say that the lime is *refractory;* and a substance which exhibits this resistance to fusion is technically classified as a *refractory substance*. Lime magnesium oxide, fire brick, and burnt clay generally, are refractory materials, and play an important role in all operations involving the use of high heat.

### Silica and Soda Ash

But if the sand—silicon dioxide—which is, as we have seen, difficultly fusible, be mixed with soda ash, and the mixture heated, the sodium salt serves as a "flux," for at a temperature sufficiently high, the silicon dioxide, which is chemically speaking the anhydride of silicic acid, exhibits its acidic property, interacts with the sodium carbonate (soda ash), displaces carbon dioxide, and forms sodium silicate, a fusible, transparent substance, of the appearance of glass, but water-soluble, and for this reason called *water glass*.

### Water Glass and Sand and Lime

If now we add more sand, and some lime to the fused water glass, and heat the mixture to a high temperature, the silicon dioxide and the calcium oxide (lime) will also interact, and will form calcium silicate, a substance which dissolves in the sodium silicate to a clear solution. This solution, however, is liquid only at a high temperature, and, on cooling, solidifies to a transparent solid—a solid solution of calcium silicate in sodium silicate, *common glass,* the soda-lime glass of the glass maker. Fruit jars, bottles, window panes are made of soda-lime glass. And all glass, regardless of its specific composition, is of the character of a solid solution, in which some of the constituents play the part of solvents.

The glass maker does not, however, conduct the process in two distinct steps. He mixes the sand, lime or limestone, and the soda ash—the fire does the rest.

### The Glass Furnace

But suppose we had such a mixture to subject to intense heat in our own laboratory. Our first concern would be the selection of a crucible capable of withstanding the high temperature to be attained, and resistive to the chemical action of the substances to be heated. We would probably select a clay crucible. We would be "inclined" also to enclose our fire in a housing of refractory material, so as to confine the heat as well as possible. In this manner, following the customary laboratory procedure, and without drawing upon our knowledge of practical glass making, we would construct a miniature

### Pot Furnace

To be sure, such a furnace, in a modern glass plant, is the product of long experience, and of considerable engineering skill, employed to the end of constructing a furnace specially adapted to the work at hand. It may be large enough to hold a dozen or eighteen pots. And these pots may hold probably a ton or two of glass; but they are merely large crucibles made with exceeding care, of selected clay; and the furnace is a development of the housing which it is customary to build about a fire for high temperature operations.

Modern glass furnaces are either gas burners, or oil burners. If the former, the gas may be natural, or it may be the type of artificial gas known as producer gas, which is essentially carbon monoxide mixed with air.

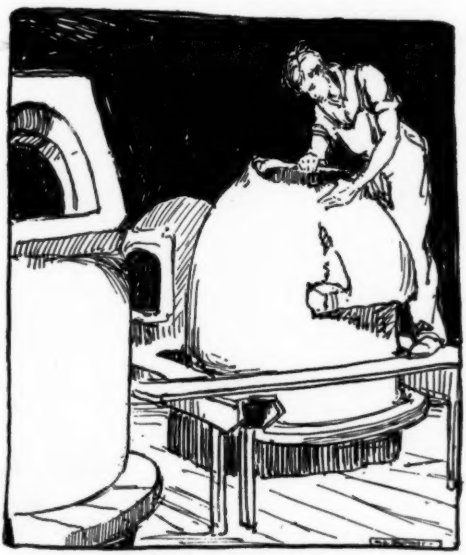
Prior to the era of gas and of atomized oil, coal and wood were the fuels used. Indeed, the American glass factories of the earlier period were located with a thought to an abundant supply of wood close at hand.

**Kneading Clay for Glass Pots**

## Glass Pots and Glass Tanks.

For common window glass, or ordinary bottle glass, the crucibles or clay pots may be replaced by shallow tanks built of fire clay, some of which are quite large, are so constructed as to furnish glass without interruption from day to day, and are known as continuous tanks. But all high quality glass is still made in clay pots.

These crucibles are of carefully selected clay, which is moistened and tramped to perfect homogeneity by the naked feet of men, just as it was done centuries ago. After the crucible has been shaped, it is kept in a warm room at constant temperature to dry out very slowly, and after having been subjected to "seasoning" for months, it is ready to be "fired" in a furnace adapted for this special purpose, an operation requiring great skill and experience. At nearly white heat it is transferred to its position in the glass furnace, is glazed with molten glass, and is ready for the



**Shaping Glass Pots**

"batch," that is, for the mixture of sand, lime and soda ash, previously mentioned. We see now how essential the potter's art is in the glass industry.

### Heating the Batch

As the temperature rises, this mixture becomes pasty, gives off water, carbon dioxide and other gases, changes to a sluggish, opaque fluid, which in turn becomes clear, but is now found to be filled with countless bubbles of gas. Continued heating expels these bubbles, and the glass is said to have become "plain." It is now cooled down to proper viscosity to admit of its being "gathered" on a long blow pipe and "worked."

The ratios of sand to soda ash and to lime may be varied within certain limits, to produce glass of desired characteristics. Thus, increasing the soda ash lowers the softening point of the glass, while increasing the sand, or the lime, makes the glass harder, and more difficultly fusible. Too much soda ash makes the glass susceptible to action of water. Such glass develops marked alkalinity in aqueous liquids, and may even be subject to "weathering." The ratios of one hundred parts of sand to about thirty of soda ash, and thirty or thirty-five of limestone, or about twelve of lime, gives a general idea of the make-up of a batch.

Glass being a homogeneous mixture, and not a specific compound, it does not exhibit a definite melting point, but softens very gradually, through a considerable range of temperature, to ultimate liquefaction. And it is this property by virtue of which glass lends itself to manipulation and shaping in so many different ways. Thus, it may be poured out in a molten condition upon a flat surface, and allowed to solidify to a "plate." It may be pressed into a mold by means of a plunger (pressed ware). It may be—if it is hot enough, and soft enough—blown into a bubble like a soap bubble. Or the bubble of glass may be blown into a mold, and thus be given the shape desired.

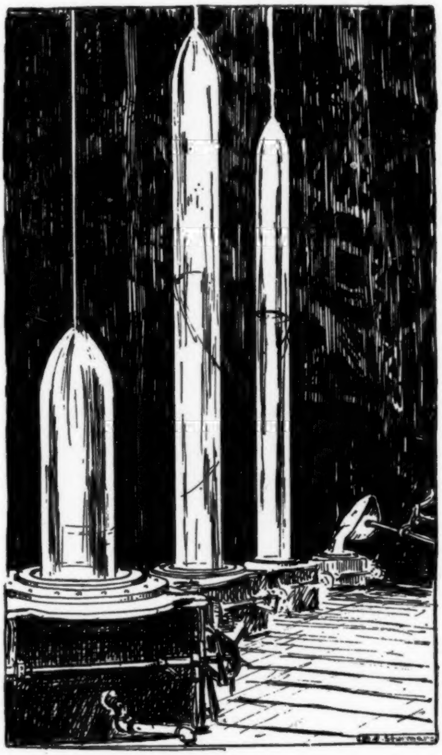
## Plate Glass

Plate glass is made by casting the glass upon a table, rolling it to the desired thinness, and subsequently, after annealing, grinding down the wavy surface until it is quite even. The grinding is accomplished with sharp sand, then with emery, and finally, a fine polish is obtained with jeweler's rouge—which explains why plate glass is free from the waves and imperfections so frequently seen in common window glass.

## Common Window Panes

They are made by gathering upon a blow pipe a large portion of the semi-liquid material, ballooning it out by blowing, elongating the large glass-bubble formed, by swinging it to and fro, like a pendulum, and, when it has become sufficiently cylindrical, cracking or cutting off the apex and base and slitting open the resulting cylinder. This is now promptly placed in an oven where heating softens the glass sufficiently to admit of its flattening to a sheet, which is then annealed, and cut to provide the sizes commonly required for windows.

By carefully gauging the amount of glass "gathered," the workman makes either single strength (1/12 inch thick) or double strength (1/9 inch thick) sheets of glass. The amount gathered may be a ball the size of a man's head, and weigh about fifteen pounds. The elongated cylinder formed is about twelve inches in diameter and about five feet long.



**Cylinders for Window Glass by Compressed Air**

## Machine-Made Window Glass

Engineering skill has evolved machinery which has made possible the use of compressed air in blowing the glass cylinders. The blow pipe is arranged vertically above a pot of molten glass, so that the end of the tube dips below the surface. Air is now forced down the tube, and the latter is slowly raised, carrying a huge, cylindrical bubble upward, to the height of probably thirty or forty feet, produc-

ing a cylinder of this length, and of a diameter of about twenty-four inches. These immense cylinders are then worked up into panes by the procedure previously described.

### Crown Glass

The window panes of ancient manufacture were generally round, and were made by blowing into the "gather," rupturing the resulting globe, and causing this by dexterous twirling, to assume the form of a disk. These disks, because of the shape of the glass bubble at a certain stage of the operation, were known as "crowns." At a later period the disks were made large enough to admit of being cut into square or rectangular panes. At the present day the use of crown glass is limited practically to the making of microscope slides and cover glasses.

### Plate Glass Manufacture

The most striking feature of plate glass manufacture is the transferring of the pot of molten glass to its position above the metal casting table, the tilting of the pot, and the flow of the sluggish, but intensely hot, and brilliant-glowing liquid, as it gradually covers the entire expanse of the metal surface, like a huge mass of hot butterscotch. The thickness of the plate is determined by metal strips fastened to the edges of the table; and a huge roller, passing over the rapidly cooling and congealing glass, irons it out to uniform thickness, which for common window plate is about three-quarters to seven-eighths of an inch.

After the plate has been annealed, it is found to present a wavy surface; but the grinding removes all inequalities, though at the expense of a considerable loss of material, for the finished plate ranges only from one-quarter inch (for small sizes) to five-eighths inch (for the larger) in thickness. For special purposes, as for example for aquariums, counter tops, etc., plate glass may be obtained fully one and a half inches thick. Unground plate, known as rough plate, for skylights and simliar purposes, is in extensive use, and constitutes a considerable portion of the factory output. Plate glass, re-enforced with wire netting, has found extensive use. A modern factory, as has been said, is a house built of glass, with just enough iron work to constitute the frame, and probably some facing of brick or concrete,—and wire glass is specially adapted for such construction. Wire glass

is now made by rolling the wire into the plastic glass upon the casting table, although the old-style sandwich glass, made by pressing together two sheets of heated glass, with the wire netting between the sheets, is still on the market. Though the process of making wire glass is seemingly no more difficult than the making of common plate, special knowledge and skill are required to furnish a product which will not crack on heating or cooling, on account of a difference in the coefficient of expansion of the metal and of the glass.

**Pouring Glass for Plate**

## Non-Shatterable Glass

Non-shatterable glass, safety glass, bullet-proof glass, or triplex-glass, as it is called in England, is made by sandwiching a sheet of celluloid, or similar material, between two thin plates, using a special cement, and high pressure, to effect perfect union. Non-shatterable glass will crack, but will not splinter, and is for this reason particularly valuable for automobile windshields, cashiers' windows, and the like.

## Figured Plate.

Remembering that glass by skillful heating may be made to exhibit any degree of plasticity, it is apparent that if the roller used in ironing the glass on a casting table carries a design, the plate can be made to present a hammered, rippled, or ribbed, or figured surface. Such glass may not only be valued on æsthetic grounds, but

also because in this way the glass becomes virtually a translucent rather than a transparent medium, adapting it for office partitions, and for other uses demanding a medium which will obstruct vision but which will transmit light.

## Chipped Glass

Chipped glass, with a configuration on its surface resembling winter's frost, has been on the market nearly twenty years, and is obtained by covering the sand-blasted or ground glass with a coating of glue, and then carefully heating. As the film of glue shrinks, and hardens, and peels off, it tears loose slivers of glass in fern-like patterns, producing a surface which looks as though it had been coated with frost. A similar result may be attained with a varnish of mastic and sandarac, dissolved in ether and benzene. By repeating the operation (double-process chipped glass), the rough and blasted surface is wholly removed, greatly improving the appearance of the plate.

## Actinic Glass

Actinic glass—so called—is a plate glass, plain or wire glass, which has the property of absorbing a large portion of the ultra-violet and the infra-red rays, thus being admirably adapted for warehouses for rubber, dyed cloth, and other materials susceptible to heat and light. Actinic glass is made by the addition to the "batch" of either natural or artificial biotite, which introduces iron, nickel, titanium, aluminum, magnesium and a trace of manganese, into the composition of the glass, and imparts to it the absorptive properties toward heat and light waves for which it is valued. Actinic glass is usually marketed in the form of wire glass, which has the mechanical strength so valuable in factory or warehouse construction.

## Glass Etching

The etching of glass depends upon the chemical action of hydrofluoric acid, which decomposes soda-lime glass into silicon fluoride, $SiF_4$, sodium fluoride, NaF, and calcium fluoride, $CaF_2$, the glass thus being made water-soluble. While all types of glass may be etched with hydrofluoric acid, there is a great difference exhibited by the different types of glass in their behavior to the etching agent. Thus resistance glass is also more resistive to hydrofluoric acid, and is for this reason more difficult to etch, while flint glass, which is potash-lead glass, is particularly amenable to this treatment.

The procedure involves covering the glass with a varnish which is not attacked by the etching liquor; a mixture of rosin, tallow or beeswax, Venice turpentine, oil of turpentine, and asphalt, serves admirably. The design is traced in the wax-like coating, so as to expose the glass, which is then immersed in the etching bath for the required period of time, and is subsequently washed. Etched graduations may be made more conspicuous by rubbing in a white or colored enamel. In chemical laboratories, barium sulphate, red lead, or carbon black are sometimes employed for this purpose.

## Color in Glass and Decolorizing

When a pane of common window glass is inspected edgewise, it is seen, usually, to have a greenish tint. This is due to ferrous silicate, formed from the iron present in the sand, and in the other crude materials used in the batch. This greenish coloration may be destroyed by oxidizing the ferrous iron to ferric iron, a result which is frequently attained by the addition of manganese dioxide. But an excess of the latter gives to the glass an amethystine hue, which is thought to be accentuated in course of time. It is exceedingly difficult, even with our present-day methods of chemical control, to balance the manganese dioxide so accurately against the ferrous silicate as to produce a truly colorless product, and all common glass usually shows "high color"—so called, due to manganese, or "low color," due to iron.

Other decolorizing agents in general use are arsenous oxide, and selenium. In some glass works sand of very high iron content is now successfully utilized because of the skillful use of these decolorizing agents.

It is important to know also that excess of manganese may operate in a purely physical manner, its color tending to compensate for the green of the ferrous silicate. This effect may be illustrated by making a solution of manganous sulphate, which is pink, and pouring it into a bottle of greenish glass, when it will be seen that neither the green of the glass, nor the pink color of the solution, is very noticeable. Indeed, by careful adjustment, the two colors may be made to disappear. Chemists and pharmacists who may have occasion to compare colors of liquids, should always keep in mind the bearing which the color of the glass container may have on the appearance of the contents, and when such comparisons are to be made, glass ware practically devoid of color should be selected.

## Varieties of Soda-Lime Glass

Soda-lime glass varies considerably in percentage composition, and accordingly varies in fusibility, resistance to water and to chemicals, varies in mechanical strength, and in other physical properties; and the practical glass maker has learned to produce a soft or hard glass, a quick-setting, or a slow-setting product, indeed, to provide the glass with the particular properties required for use in connection with certain automatic bottle-making machines, or for "hand-work."

Increasing the soda ash in the batch lowers the softening point; increase in quantity of sand or of lime, raises it. But glass high in soda content is more susceptible to action of aqueous liquids. Indeed, common bottle glass will produce decided alkalinity in distilled water, and will quickly develop a brown color in physostigmine solution, which in a resistive glass will remain without change.

## Other Types of Glass

The soda may also be replaced by potash, the lime by the compounds of other metals, notably by compounds of barium, lead, zinc and aluminum, and the silicate radical may be replaced in part by borate or phosphate.

The introduction of borates lowers the coefficient of expansion, and thus makes possible the production of heat-resistive ware, which is a product of recent development. Speaking generally, heat-resistive glass is also resistive to chemicals, and has great mechanical strength. It may be pointed out in this connection that the term heat resistive has reference not only to a high softening point, but also to the endurance to a marked degree of sudden temperature changes.

The following makes of resistive glass ware are well known:

Jena chemical glass ware—A boro-silicate glass of sodium, zinc and aluminum.

Nonsol—Boro-silicate of sodium and zinc, with magnesium and aluminum, and traces of arsenic and antimony.

Pyrex—Boro-silicate of sodium and aluminum, with excess of silica and traces of arsenic. (May be obtained arsenic free.)

Libbey—Boro-silicate of sodium, aluminum and lead, with a little arsenic.

Macbeth-Evans—Boro-silicate of sodium, zinc and magnesium, with traces of arsenic, and some antimony.

The Bureau of Standards, in Bulletin No. 107, gives analyses of these products as follows:

**Analyses**

| *Ware* | *Kavalier beaker* | *M. E. G. Co. beaker* | *Pyrex beaker* | *Jena beaker* | *Jena flask* | *Nonsol beaker* | *Fry beaker* | *Libbey beaker* |
|---|---|---|---|---|---|---|---|---|
| $Al_2O_3$ | 0.14 | 1.0 | 2.0 | 4.2 | 4.2 | 2.5 | 2.7 | 2.1 |
| $Fe_2O_3$ | 0.08 | 0.35 | 0.25 | 0.25 | 0.27 | 0.23 | 0.22 | 0.44 |
| $ZnO$ | .... | 5.6 | .... | 10.9 | 10.9 | 7.8 | 3.6 | .... |
| $PbO$ | .... | .... | .... | .... | .... | .... | .... | 1.0 |
| $MnO$ | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.03 | 0.03 |
| $CaO$ | 8.7 | 0.66 | 0.29 | 0.63 | 0.56 | 0.79 | 2.6 | 0.42 |
| $MgO$ | 0.17 | 4.3 | 0.06 | 0.21 | 0.25 | 3.4 | 2.6 | 0.08 |
| $Na_2O$ | 7.1 | 10.8 | 4.4 | 7.5 | 7.8 | 10.9 | 9.8 | 8.2 |
| $K_2O$ | 7.9 | 0.30 | 0.20 | 0.37 | 0.31 | 0.30 | 1.5 | 0.67 |
| $SiO_2$ | 75.9 | 73.0 | 80.5 | 64.7 | 64.7 | 67.3 | 68.6 | 75.9 |
| $B_2O_3$ | .... | 3.6 | 11.8 | 10.9 | 10.6 | 6.2 | 8.1 | 10.8 |
| $P_2O_5$ | 0.08 | .... | .... | .... | .... | .... | .... | .... |
| $SO_3$ | 0.20 | 0.02 | .... | .... | .... | .... | .... | .... |
| $As_2O_5$ | Trace | 0.02 | 0.70 | 0.14 | 0.19 | Trace | 0.18 | 0.36 |
| $Sb_2O_3$ | .... | 0.60 | .... | .... | .... | 0.62 | .... | .... |
| Total | 100.29 | 100.27 | 100.21 | 99.81 | 99.79 | 100.05 | 99.93 | 100.00 |

Contrast these analytical data with the analyses of common glass for bottles, window panes, and the like:

| | *Bottles* | *Window Glass* |
|---|---|---|
| $Al_2O_3$ | .5 | .1 |
| $Fe_2O_3$ | .3 | Traces |
| $ZnO$ | .. | .. |
| $PbO$ | .. | .. |
| $MnO$ | .. | .. |
| $CaO$ | 17 | 12.4 |
| $MgO$ | .5 | Traces |
| $Na_2O$ | 11.2 | 13.7 |
| $K_2O$ | .. | Traces |
| $SiO_2$ | 70.00 | 71.5 |
| $B_2O_3$ | .. | .. |

A potash-lime glass is more brilliant than soda-lime glass, and is used for table ware, and for artificial gems. Hollow ware of this glass may be distinguished by its clearer "ring" when tapped with a pencil.

Flint glass is potash-lead glass, has more brilliancy than potash-lime glass, and is used for the more expensive types of "cut glass ware." It is characterized by its weight, is rather soft, and easily scratched.

Optical glass varies considerably in composition. It may contain either sodium or potassium, or both, may contain barium in place

of calcium, may be an optical flint glass, which means that it contains lead, may contain aluminum, or zinc, may be a silicate glass, or a boro-silicate, or a phosphate. The boro-silicate and phosphate glasses were evolved at Jena in 1883, and are of value because they do not exhibit the secondary spectrum—a discovery which led to the development of the modern microscope, and which thus links up with the extraordinary progress made in biology in recent times.

As has been said, glass may be made to conform to definite specification—within certain limits, to be sure—as to physical properties. The physical properties which are of special significance are, the thermal expansion, tensile and compression strength, elasticity, hardness, specific heat, thermal conductivity, dielectric constant, solubility in water, and in alkaline solutions, refraction, dispersion, absorption of the different wave lengths of light rays, absorption of ultraviolet, and of infra-red rays.

Boron reduces the coefficient of expansion and raises the mechanical endurance. Aluminum increases the compression strength, zinc the tensile strength, both tend to increase the resistance to chemical corrosion.

Lead and barium raise the refractive index. In short, the glass maker has learned to predetermine the properties of the product, by virtue of his knowledge of the properties imparted by the basic and acidic substances available for glass making.

## Colored Glass

Reference has been made to the greenish color of common bottle glass, and to the lilac coloration of some window glass, the former due to presence of ferrous iron, the latter to manganese. The tinge produced by an impurity may, of course, be deepened by the deliberate addition of more of the same color-imparting substance; and by experimentation, extending through many centuries, the glass maker has learned to produce glass of practically any color which may be desired. To be sure, the color of the resulting glass may be in decided contrast to the color of the substance added to the "batch." This result may be due to chemical action, and to the production of a new substance, or it may be due to minute subdivision. If, for example, a liberal quantity of bone ash (calcium phosphate) is mixed with the molten glass, a milk white glass will result, and it will be found to have lost its transparency. In other words, the glass will

exhibit the color of the bone ash. If, however, amorphous carbon, which is black, be added in small quantity, the finely subdivided, but undissolved particles, will color the glass light or dark amber—according to the amount used—and the glass will be found to have lost in transparency, but will not prove to be opaque.

So we may conveniently classify colored glass under the following heads:

Color due to suspended matter in rather large particles, incorporated either by direct admixture, or, as in case of certain opal glass, by precipitation on partial cooling.

Color due to colloidal solution or suspension, as in case of elementary carbon (amber), elementary selenium (red), elementary copper (red), elementary gold (red to purple, according to size of particles), elementary silver (yellow).

Color due to silicates which exist in solution—cobalt (blue), manganese (lilac to purple, according to amount used), chromium (green), ferrous iron (light green), nickel (pink to purple, in a potash glass), uranium (greenish yellow).

Not only is the color obtained by addition of certain coloring agents influenced by the quantity employed, but also by the method of treatment. Thus copper salts may yield a blue glass under oxidizing condition, and a red glass under reducing conditions, when elementary copper is formed in colloidal suspension or solution.

When gold glass is removed from the pot, it is devoid of the characteristic ruby color, which develops only on re-heating, and as the minute particles aggregate to form particles of larger size. If the process is prolonged, the color changes to purple and to brown, and eventually, particles of yellow, metallic gold, become visible. Aventurine glass, used as a setting in rings, is made by this process.

Flashed glass is made by overlaying a sheet of colorless glass with a thin film of colored glass. Designs may be cut through the layer of colored glass by the grinding operation as employed in the production of "cut glass." Flashed glass is quite common, and is largely used when conspicuous lettering is wanted for signs or for glass door panes.

Cameos are made from flashed glass, the design being carved out of the uppermost layer, and made to show conspicuously by virtue of the contrast in the colors of the strata.

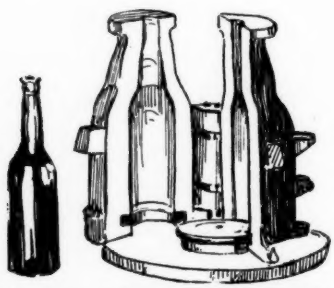
Iridescent glass is made by subjecting the glass ware while hot

to the vapors of certain metallic salts, particularly to those of stannous chloride, strontium nitrate, barium chloride or bismuth nitrate. Not only plain glass, but also colored glass may be subjected to this process.

Art glass for cathedral windows may be glass "colored in the pot," or it may present a marbled or variegated appearance, due to imperfect mixture of two lots of glass, differing in color. Its surface may be smooth, or it may have been subjected while hot to the "roller treatment," and given the "hammered," "rippled," or "moss" surface, so generally admired in art glass.

Art glass, like any other plate glass, may be softened by skillful heating, and may be bent and molded over forms, to any shape desired.

Artificial pearls are made from tubing. The beads are coated on the inside with a mixture of finely ground fish scales and ammonium chloride. But for very cheap beads a paraffin-like substance is used for the coating.



**Mould for Automatic Bottle Machine**

## Bottles and Other Containers

Common bottles are made of soda-lime glass. If special care has been taken to obtain a clear and practically colorless glass of considerable brilliancy, the bottles are, in the channels of trade, classified as "flint" ware, although real flint glass is quite different in composition, being a potash-lead glass. True flint glass is not used for bottles.

Bottles are made by blowing the glass-bubble in a mold. This was accomplished by lung power until rather recently. At the present time common bottles are generally made by means of automatic machines, which operate by sucking the required quantity of semi-liquid

glass into a mold, and then, by air pressure, ballooning the mass to fit the enclosure.

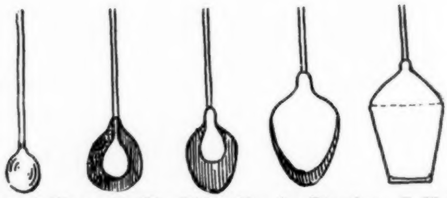
Homœopathic vials are not made in a mold, but from tubing, cut to the required length. Automatic machines fuse shut one end, and shape the other to a cork or screw-mouthed top. Automatic carriers convey the tubes to the slender blow pipe flames by means of which the ends of the tubes are re-heated for the sealing or the shaping.

Shallow dishes, or jars, are made by pressing the glass into the mold by means of a plunger.

Museum jars are blown and shaped by hand. The operation involves blowing a balloon, lengthening this by swinging, flattening the apex, making the balloon cylindrical by rolling it on a plate, cracking the cylinder off the blow pipe by means of a thread of hot glass, spinning a layer of glass around the top, and with a tool, shaping a serviceable lip.

**Blowing Hollow Ware**

Hollow chemical glass ware, such as flasks and beakers, is always blown by lung power, shaped by swinging, twirling, etc., and its production calls for exceptional skill.



**A. The Gather of Glass. B. The Distention by Blowing. C. Showing Result of Swinging. D. Further Distention and More Swinging. E. Flattening Apex, Rolling Sides to Desired Taper and "Cracking Off."—After Thorpe's Dictionary of Applied Chemistry.**

Condensers, Soxhlet tubes, potash bulbs, and similar glass apparatus familiar to chemists, can be constructed from tubing, which is heated in a blast or blow pipe flame, so that it may be blown into bulbs, constricted, "bent," or welded, as may be required. To weld glass in the making of apparatus, it is sometimes found necessary to use a low-melting glass as a kind of solder. Glass blowing and shaping with the aid of a blow pipe flame is usually spoken of as lamp work—in contra-distinction to the work at the glass furnace.

## Glass Tubing

A large mass of glass is gathered on a blow pipe, and by blowing, swinging and rotating on a plate or marver, is formed into a thick-walled cylinder. A helper gathers a small mass of hot glass on an iron rod, and attaches this to the apex of the aforementioned cylinder. The latter is now supported between the two operators, and is drawn out as the helper walks backward, and while the chief operator rotates his blow pipe, and blows, so that the tube cannot collapse. Experienced tube blowers will in this manner make tubing seventy-five to eighty feet in length, of the desired diameter and of practically uniform bore.

Tubing is made more rapidly by an automatic machine, which delivers about two feet per second. By compressed air, the molten glass is made to assume the form of a cone which issues from the opening as a tube, and a mechanical carrier pulls the tube forward at a steady rate to the cutting machine, by means of which definite lengths are cut and stacked.

## Cutting Glass

In the factory a large cylinder of glass may be cut by spinning a thread of hot glass around it. A wire, electrically heated, accom-

pishes the same result. Funnels, bottles and other thick-walled vessels may be cut by the use of a blow pipe flame, which is made to issue through a narrow slit, before which the vessel is rotated. There are also "glass saws," with small teeth, diamond-tipped, which eat their way through hard glass with astonishing ease.

## Annealing Glass Ware

When a drop of molten glass is allowed to fall into water, the glass blob solidifies, forming the well-known Prince Rupert drop, which, when its surface is scratched, or its tail broken off, flies into countless fragments. Whenever red-hot glass is cooled too quickly, it exhibits internal strain, more or less pronounced, and breaks on the slightest provocation, or for no apparent reasons—so it seems. In short, it exhibits, though in a lesser degree, the characteristics of the Prince Rupert drop. But when the cooling of the glass is very gradual, the necessary internal readjustments take place, internal strain is not developed, and the glass possesses much greater strength and endurance. We say it has been annealed.

Strains in glass ware present no visible evidence of their presence, but they may readily be detected by means of the polariscope.

The annealing operation may vary in point of time consumed, from four or five hours to several days, and is determined by the composition of the glass, and the nature of the ware subjected to the process. The range of temperature is likewise indicated by the chemical composition; thus soda-lime glass annealing at a lower temperature than does resistive glass, and glass with a high silicon content at a higher temperature than glass with a high soda content. Researches of great importance have been carried out in the last few years on the problems incident to annealing, and the results obtained have made possible a considerable shortening of the operation. One may see also in a modern plant, small and large articles, thin-walled and thick-walled ware, being annealed at the same time—a procedure which was not deemed practicable a few years ago.

There are two distinct types of annealing ovens. In the one, called the annealing kiln, the fire is allowed to die down gradually; in the other, called a *lehr,* the glass ware rests on a moving platform, and, at a certain (very slow) speed, passes through the oven, which is virtually a huge muffle furnace, terminating in a kind of tunnel about forty feet long, but which, for certain types of glass ware, may be extended to the length of three hundred feet.

Chemical apparatus made by bending, ballooning, constricting and uniting tubing, requires re-annealing, as this so-called lamp work involves heating the glass to redness and to its softening point. Such apparatus, constructed in a chemical laboratory, may accordingly be expected to be exceedingly frail, and subject to fracture—a fact which every chemistry student has no doubt observed. It will be seen also why a fracture in thick-walled ware cannot be mended successfully by welding—certainly not if the welding is to be done in the proximity of a liquid.

## Optical Glass

The manufacture of optical glass is now successfully carried on in this country. As has been said, such glass may be lead glass, or barium glass, may be silicate, boro-silicate, or phosphate; in short it exhibits a considerable range in its composition. In the making of optical glass the use of decolorizers is precluded; so pure materials, particularly iron-free sand, must be employed, for manganese, and other decolorizers, which remain in the glass, exhibit absorptive action on light waves, thus rendering the glass unfit for certain purposes.

Optical glass must have the proper refractive indices for the different wave lengths of light, must be free from color, and from defects, such as waves, opaque spots, bubbles, etc.; must be free from strains; must not scratch or break easily, yet must be hard enough to admit of grinding and polishing. It should also show high resistance to weathering, and not lose its brilliancy with age.

The importance of the optical glass industry is apparent when we remember that not only telescope lenses, but also microscope and camera, as well as spectacle lenses, are of optical glass. Without it, many of us would go through life with myopic or distorted vision. There would be neither photographs nor moving picture shows. Bacteria would be with us, to be sure; but their connection with human ills would be unknown, and many of the benefits which have resulted from scientific progress, would not be ours to enjoy. Indeed, it is impossible to enumerate here the divers lines of scientific research made possible by the lens maker, and to estimate the debt which humanity owes to the optical glass industry.

It has been possible to touch only the high spots in this story of glass—the substance which was first used for beads and ornaments, then for small containers and vases, next for table ware and for windows—and now—well, for how many purposes *do* we use glass? We huddle behind our plate glass window, as snug as a worm in a hazel-nut, yet may look out upon life, through our bifocal spectacles, and see the milkman deliver his supply in glass bottles. When darkness falls, we turn on the Mazda light—a glowing filament of tungsten, suspended in a bulb of glass, and receiving its extraordinary powers through a wire run along poles, but affixed to the same by the intervention of gobs of glass. We sit down at dinner to a table resplendent with glass, and conclude our repast with a quarter section of a pie baked in a pyrex dish. Then we may glance through the family album, and question whether it is really true that the photographic lens never lies. Having consulted a plate of glass backed with a film of silver, to "see ourselves as ithers see us," we may go to the movies, and view the high-priced footprints left by Charlie Chaplin on the sands of time, as recorded through the lens of the camera man, and projected also by a lens of glass. When the supply of diamonds, rubies and emeralds is not equal to the demand, we eke out with potash-lead glass, which has been made to serve as a setting for many an engagement ring. Through glass we search for the elusive microbe, for the spectrum bands of the rare element, for the distant stars. Our great industries present but amplifications of work carried out first in test tubes or flasks.

The splendid advances in chemistry and in biology, made in recent times, would not have been possible but for glass. Truly, 'tis an interesting subject, with many ramifications, and well worthy of our interest and further study.

# ABSTRACTED AND REPRINTED ARTICLES

## HERB-LORE IN EARLY IRELAND.*

By A. C. S.

Among the early Irish, as in all Celtic nations, the ancient and mysterious sect known as the Druids combined the roles of priests, physicians and seers. In their capacity of healers we learn, according to one old writer, that "these leeches were well versed in the book of Nature, and were acquainted with many marvels of natural magic and the properties of many herbs, were students of astrology and learned in the matter of omens, auguries and exorcisms." To some of these early physicians were attributed very special medicinal and curative powers. For instance, it is on record that a drink given by the hand of Feon, an early leech, was claimed to be able to heal any wound or to cure any disease.

According to the "Book of Invasions," the ancient and rival Celtic tribes, called respectively the Fomarians and the Tuatha De Danaans, had each a special Druid leech, whose particular duty it was to minister to the wounded on the night after a battle and restore them to fighting fitness for the next day's conflict. Diancecht, the most famous of these leeches, is said to have prepared a bath of herbs and plants possessed of medicinal properties in the rear of the forces of the Tuatha De Danaans when that warlike tribe fought the Firbolgs at the battle of Moytura. Into this bath the wounded plunged and emerged healed, according to the story, owing to the action of the Shan Ici," which was regarded as a sovereign specific for all diseases.

In this battle King Nuada is reported to have lost an arm, whereupon Diancecht stanched the blood and dressed the wound. The case seems to have been rather too much for the powers of the magic bath, but the old leech's son, Miach, rose to the occasion by having an artificial hand wrought in silver for the monarch, who afterwards bore the name of "Nuada of the Silver Hand." The miraculous virtues of this hand were naturally a fruitful source of in-

*Reprinted from the *Pharm. Journ. and Pharm.*

spiration for the ancient balladmongers; but, all the magic elaborations woven round the story notwithstanding, it seems really to have been a great triumph in early mechanical, surgical and artistic skill.

Twenty-seven years later, at the second battle of Moytura, in which King Nuada of the Silver Hand fell, Diancecht, jealous of his son's superior knowledge, is reported to have slain him. Before this regrettable incident, however, Diancecht, assisted by his son and daughter, prepared a great healing bath with the principal herbs and plants of Erin, and pronounced incantations over it during the contest. Into this bath the wounded soldiers immediately plunged, and were restored so that they were "able to fight again and again."

After a time, the legend continues, "there grew up from Miach's grave 365 herbs from the 365 joints and sinews, each herb with mighty power to cure diseases of the part it grew from." These his sister plucked, and having sorted them according to their virtues wrapped them in her mantle. But jealous old Diancecht again caused mischief by mixing them up so that no leech could have complete knowledge of their distinctive properties.

Coming to a later period, but still beyond the range of authentic history, we learn that Josina, the ninth king of Scotland, was educated in Ireland by native physicians, and wrote a treatise on "The Virtues and Powers of Herbs." Whatever amount of truth there is behind this legend, it seems to indicate that at a very early period the physicians of Ireland had established a reputation for great skill. In spite of their legendary character, too, these old stories are interesting and useful, inasmuch as they show that the use of herbs as applied to healing was common in the shadowy times before the recording of events began.

## The Historical Period.

Coming out of the shadows of legendary times into the daylight of chronicled history, however, we find that at a time when the light of medical knowledge had not yet dawned in many other countries, it was comparatively bright in Ireland. From the oldest period of authentic Irish history, indeed, the medical literature of Greece and Rome was cultivated, therapeutics, materia medica, and anatomy being studied, and surgery, gynæcology, and obstetrics practised, and the Irish professors of healing were then held in high repute. From numerous instances recorded by the ancient chroniclers, from the in-

troduction of Christianity in the fifth century till about the end of the fourteenth century, some idea may be gathered of the knowledge and methods of the medical practitioners of that period. Wounds were usually treated with decoctions or poultices of herbs mixed with honey, similar treatment being applied to broken bones. Diancecht, who is said to have recognized fourteen separate disorders of the stomach, for which he prescribed mostly vegetable remedies, had among his prescriptions one known as "Diancecht's Porridge," which is affirmed to be the oldest recorded in Irish history. This was employed for the treatment of "colds, phlegm, sore throat, and the relief of evil things in the body such as worms and the like," and instructed that hazel buds, dandelions, chickweed, and wood sorrel be boiled together with oatmeal and taken morning and evening, when the cold or other trouble would disappear. He also recommended a poultice of baywort to be tied round the neck for "throat-cats" or sore throat. White frankincense beaten up with white wine he prescribed for restoring lost memory, one part of gentian and two parts of centaury bruised well together and mixed with water to drink as an "excellent cordial," and saffron as a tonic.

### Quaint and Curious Prescriptions.

Among old manuscripts written in the early Irish language are to be found many quaint and curious prescriptions . One such, about the tenth century, which is suggestive of the advertisements of some present-day manufacturers of "cure-all" specifics, begins:

"A preservation for the dead, the living, for the want of sinews, for the tongue-tied, for swelling in the head, of wounds from iron, of burning from fire, of the bite of the hound, it preventeth the lassitude of old age, cures the decline, the rupture of the blood vessels, takes away the virulence of the festering sore, the poignancy of grief, the fever of the blood—they cannot contend with it—he to whom it shall be applied shall be made whole."

The following recipes taken from an old Celtic manuscript give some idea of the material medica and therapeutics of the fourteenth century:

"For baldness.—Let calcine a raven, his ashes boil in sheep's suet, and rub to the head, and it cures. Item: With mice fill an earthern pipkin, stop the mouth with a lump of clay, and bury it beside a fire, but so as the fire's too great heat reach it not. So be it left for a

year, and at a year's end take out whatever may be found therein. But it is urgent that he who shall lift it have a glove on his hand, lest at his fingers' ends the hair come sprouting forth."

This spirit of exaggerated optimism can hardly be blamed after considering the claims of some present-day hair-restorers.

"For paralysis.—Take a fox with his pelt and his inwards, boil him well till he part from the bones, and, the patient's body being first well-scoured, bathe the limbs, or even the whole person, in the brew."

"For falling sickness, put salt and white snails into a vessel for three nights, add seven woodbine leaves, mix to a paste, and poultice for nine days."

A plaster of mandragora and ground ivy laid upon the head is also prescribed. For dysentery, woodbine and maidenhair are ordered boiled in new milk with oatmeal, to be taken three times a day. For liver trouble, leaves of plantain are advised, with wild sage, shamrock, dockleaf, valerian, and the flower of the daisy, to be plucked by the person before sunrise while fasting, on a Monday or Wednesday, and whilst saying a "Hail Mary" and a "Paternoster." The ingredients should be boiled and strained, and a glassful of liquor taken twice a day, the residue of the herbs being carefully burnt. For lumbago, dogfern roots were used, with shamrock well cleaned and powdered, and mixed with butter, made on a May Day with holy salt into a paste, which had to be rubbed into the back to the accompaniment of the Lord's Prayer and a "Hail Mary," and left on "till cured."

## The Shamrock.

The shamrock, famed as the national Irish emblem, has been the subject of many wonderful legends connected with St. Patrick, the Irish patron saint. Strange to say, however, it is uncertain exactly which plant is featured in these legends or to which plant the name was first applied. The word *seamarog* in Erse means "little trefoil," and is applied to various kinds of trefoil by the Irish writers. The plants now worn on St. Patrick's Day as the Irish emblem are the black nonesuch (*Medicago lupulina*) and the Dutch clover (*Trifolium repens*). The wood sorrel (*Oxalis acetosella*) is the plant referred to as shamrog in the old herbals and, as one chronicler states, it was a sour plant eaten by the Irish. The shamrock was used medicinally as an anodyne, and, according to one superstition, when gathered by

a gloved hand and carried secretly into a house where there was an insane person, that person was cured.

From these old legends and chronicles, cloaked with superstition and fancy as they are, it can be seen that these old physicians, with all their fantastic cures and quackeries, helped in their primitive way to lay the foundations of the great modern sciences of materia medica and therapeutics.

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## A GREAT HEALTH PLAN.*

However deep we dig into the past, we find men making and taking medicine. Disease must have been coexistent with the race, since its relief or cure seems to have been one of the common aims in every age. Medicine, in some form, may be as old as man. Yet man does not know much about it.

The earliest therapeutic measures were devoted to driving demons from the bodies of their victims. This was done either by recital of charms or magic over the ailing part, or by internal or external use of roots and herbs. All such procedure came within the province of the priest.

The ancient Egyptians were among the first, if not the first, to attempt any kind of scientific medicine. They went into the mineral and animal world, as well as the vegetable, for healing material. They evolved a system of drug administration which indicates considerable study and research, and marks them as pioneers in intelligent use of nature's varied defenses against disease.

The Hebrews turned to hygiene, yet held apothecaries in high esteem, as the Bible attests. The Chinese claim the study of medicine to have been coeval with the founding of their empire. The Greeks, the Alexandrians and the Arabs, however, stand out as the foremost medical men of ancient times. Some of their knowledge has not been surpassed even in our age of boasted progress.

Throughout the medieval period, especially during the sway of the alchemist, medical investigators and apothecaries did much to improve methods of preparing their remedies, and discovered many new substances of therapeutic value. The famed Paracelsus, who in the fifteenth century practically founded the science of chemistry, sub-

*From *The North American.*

stituted tinctures, essences and extracts for the strange and often disgusting preparations then in vogue and first used mercury in the treatment of syphilis. Between his time and the early years of the nineteenth century the practice of medicine became so complicated and confused, by reason of conflicting theories, that the unborn query of a picturesque Kansas congressman, "Where are we at?" stirred mightily in the public mind.

Modern therapeutics may be said to have begun with the discovery of morphine in 1817. Thenceforth the chief weapon in attacking disease was to be a rational application of a drug power to body needs. Thus was founded the present method of treatment, which implies the use of remedies based on knowledge of the diseased condition; of the nature of the disease itself, and the physiological action of the agent employed, as determined by experimental investigation.

In order to succeed in such an effort, it is obvious that knowledge of the action of drugs must include the manner in which they affect nerve centers, respiration and circulation, and their influence on blood pressure and body temperature. This predicates a need for exact data as to their nature and power. Also, like information concerning serums and all compounds used in treatment of disease. And despite modern advance in the science of medicine, this basic need remains today largely unmet.

Its magnitude may be gauged by the fact that the annual drug bill of this nation is $500,000,000. Meantime, the number of medicaments is increasing at a tremendous rate, out of all proportion to the sum total of systematic research.

According to a recent report of the American Chemical Society, thirty years ago there were 2700 drug items on the market, and today there are more than 45,000.

Many of these must be comparatively worthless. Doubtless there are many which duplicate the action of others. Some are known to be positively harmful. But such a thing as a drug housecleaning never has been attempted, because intelligent and proved leadership has been lacking. Calling attention to a situation which it says "results in the frailties and suffering of humanity being grossly exploited," this report continues:

"Several centuries ago the chemist and the physician co-operated closely for the alleviation of suffering; the chief aim of chemistry in those days was the providing of medicinals for the use of the physician.

"Then the physician and the chemist separated, the physician looking more and more to other means to effect his ends, while the chemist turned to the production of wealth in the industries.

"Later the physician turned back somewhat to his former aid and found most useful substances awaiting him. For instance, ether had been discovered in the thirteenth century, but its value as an anesthetic was not definitely recognized until 1846."

Emphasizing the growing need for exact knowledge of the nature and potency of medicines, this report says of the physicians:

"Their antitoxins, their most powerful weapons in combating invading germs, are chemical substances of specific curative power but of unknown composition, and never yet isolated as pure principles. They are always injected into our bodies in the form of crude mixtures, loaded down with undesirable and to some extent even harmful ingredients.

"The isolation of the pure principles by chemical methods, supplementing the pioneer work of the bacteriologist and pathologist, would prove one of the greatest advances in medicine, giving the practitioner the power to combat an infection by swift, exact and sufficiently powerful doses, where now he often acts with hesitation and misgiving."

To even the lay mind the common sense of such a course is clear. Having muddled through a period of marvelously increased exact knowledge in many other lines of human endeavor, and at a frequently confessed cost of cemetery additions, the practice of medicine now faces—and to itself, at least, admits the magnitude of the need—a getting down to exact scientific knowledge of what it can and cannot do with drugs.

In the estimation of all disinterested workers for better health it is high time, to state the matter simply, to ascertain not only the pure principle of a given drug or combination of drugs, but to define a standard of manufacture which will guarantee the benefits of these principles equally to the user in New York or New Guinea.

Today, with amazingly few exceptions, the doctor who prescribes a drug is largely ignorant of its actual possibilities in dealing with the diseased condition, not because of deficient knowledge on his part, but because of a pitiful lack of available precise and complete knowledge concerning the medicament in question.

Furthermore, in the case of thousands of drugs, he cannot be sure the ingredients used to fill his prescription in one part of the world will be identical with so-called similar ingredients in another

part. Such a condition, of course, cannot but weaken the very defenses upon which we count so largely in our fight against disease. To eliminate this weakness, therefore, would be to confer on mankind a benefit of incalculable worth. And that is what the Philadelphia College of Pharmacy and Science plans to do with the $2,000,000 fund it now is seeking to raise from its alumni and the public.

With this sum of money—small, indeed, when the possible benefits are considered—this institution, which for more than a century has given Philadelphia world fame in the field of pharmacy, plans the foundation of research laboratories to meet the universal need for combining the services of the trained chemist with those of the skilled physician, the pharmaceutist, the bacteriologist and the serologist.

If the present campaign is successful, construction and organization of these laboratories will follow the erection of the new college buildings. Leaders in the various research fields above mentioned will be permanently employed in these laboratories, and the closest co-operation will exist in this group toward discovery of the pure principles of drugs, serums and compounds.

Such work cannot but lead to improved treatment of many diseases, and perhaps to discovery of specifics for others now considered incurable. But the first object will be to purify and simplify many medicines now on the market; to define standards, which will assist in making the practice of medicine a more exact science, and to lead in proper and dependable methods of manufacture.

Here we have a plan of almost unlimited possibilities in the fight against disease, one which contemplates an eventual enlargement to include with the college a large hospital and a manufacturing plant, together with an adequate animal farm for biological production, and an extensive botanical and research garden for the systematic cultivation and study of therapeutic drug plants. Characterizing this as the dawn of a new era in scientific pharmacy, Rear Admiral W. C. Braisted, former surgeon general of the navy, and now president of the Philadelphia College of Pharmacy and Science, says:

"This would allow the equal and co-ordinate union of the college for teaching, research and standardizing all that pertains to pharmacy and its allied branches in chemistry and bacteriology, the proper preparation for safe and scientific administration of its products, and the determination of their value at the bedside in the associated hospital by the best staff of attending and consulting physicians the city could produce.

"This would bring about, ideally, the union of the doctor, the scientific pharmacist and the highest and best method of making the therapeutic agent for human use. As a co-ordinate body they would work constantly together, and the final approved therapeutic agent, with its full history, characteristics, mode of application and method of manufacture, would then be given to the world for its use and to the commercial manufacturers for production."

The value of such co-operation is too obvious to need comment. It would eventually eliminate guesswork from medicine giving. It would so standardize medical products as to largely increase not only their efficacy, but also their safety. In short, it would mean just such a change in the field of healing as scientific research and practical experimentation have brought to pass in many departments of industry. So this Philadelphia institution seeks to function in one of the really great works remaining to be done, and its endeavor should be enthusiastically supported by all who value health as the first wealth.

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## WHITHER?[1]*

### I.

Whether one enters a group of socially minded thinkers or a group of doctors in private conference or in public assembly, one soon become conscious of a restlessness regarding the profession of medicine. What does one think of membership in the American "Royal" College of Surgeons or Physicians, of medicine practiced under the ægis of a "group," of higher education for nurses, of chiropractors, of Christian Sciencers, of medical societies going to the public with their wares? Is the patient still the doctor's, or does he belong to a hospital? Should "industrial" medicine be developed? Should hospitals be standardized? Should the medical educational requirements of six years be lengthened to seven or eight or nine? Where ought one to stand on "state" medicine; should medicine have a portfolio in the cabinet; should clinical teachers be forbidden private practice? Should hospitals be open only to staffs or to all licentiates in medicine?

[1] Remarks made at the banquet of the Ohio State Medical Association meeting, May 3, 1922.

*Reprinted from *Science*.

Are the answers to these problems really hard to find?

The medical profession has been caught in the swirl of the times. In the press of the moment it has forgotten its origins. Lost sight of are the circumstances, the principles and the ideas which in all times have made medicine what it is. Cause and effect are being mixed up. The present day shows too much of the form and too little of the spirit of that which has given the doctor his place and power.

## II.

It is no new discovery that the tyranny of a crowd is no better than the tyranny of an individual and that both lead to death. In spite of our cry that we are democratic we are almost exactly the reverse. We certainly dress alike; it has been said that we look alike; the corollary is that we think alike. Tersely put, we work in crowds and think in gangs and when applied to medicine we forget why anything smacking of such forms has prospered.

A case in point is offered by the diagnostic and operating "groups" in medicine which today infest us. Blinded by the success of one or two prototypes, medical men have concluded that their form accounts for their popularity. The fact is that none such has prospered—save as any business which is not bankrupt may be said to be prospering—except as the old substance of medical practice has been kept alive in the group by one or two dominating personalities. Without such vital souls there is left only a paper organization—all, it is safe to predict, that will survive when the present day medical or surgical leaders of these groups are gone.

A second case is offered by the specialists. Men formerly were driven into specialisms through professional or popular demand. A doctor peculiarly skillful of hand or mind had his day filled for him by those insistent that he do continuously the thing in which he excelled. The present day specialist is a self-anointed soul. He knows that to have a large view in medicine means hard work and broken hours; he sees an "opening" for a specialist, spends six weeks learning the necessary tricks and succumbs to the easiest way. It will be answered that specialists are needed to do the complicated things of blood analysis, bacteriological study and X-ray investigation. The truth is that these newer things have not become additions, as they should be, to the older and established methods of diagnosis and treatment but lazy-man substitutes for them—and poor ones. In the

main, these "scientific" methods have not decreased error in diagnosis or broadened treatment. Chemical methods of blood analysis have not enlarged our knowledge of kidney disease; failures to obtain positive bacteriological findings have permitted patients to go without a diagnosis where an older generation of doctors would have judged correctly the nature of the disease from its signs and symptoms; while the ease of looking through a patient with X-rays has dulled the touch, the sight, the hearing and the judgment which made great our predecessors.

It is the common thing for our patients to be sent to a laboratory man, an X-ray specialist, a nose and throat surgeon, a skin doctor and a half dozen different types of special surgeons. It has even been proposed that we need a specialist to determine what medicine shall be given. But those engaged in these types of practice are beginning to realize its dangers. The dangers are to be met with another specialist—one who is to gather together the findings of all the doctors and tell the patient what he came a-seeking. He is to be known as an integrator. I sent an article proposing this scheme to a friend of mine with the marginal note that our colleagues were beginning to look for doctors once more.

I know a place where one can serve himself to a diagnosis as one serves himself to a meal in a cafeteria. One starts with a numbered card and buys himself at different counters and from different men a general examination, an investigation of the throat, an X-ray plate of the gall bladder, a dental overhauling, a surgical operation and a plaster cast for the foot. Each item carries its price, which is punched on the ticket. What the scheme takes no account of is that the patient does not care whether he has Hirschsprung's disease, erythema nodosum or pseudo-hypertrophic muscular atrophy. What he is after is a plain statement of what is the matter with him, and whether he can be "cured" or not; also there is wanted a little appreciation of his state of mind and some understanding of the economic hardships of his family in the interim of being ill. The food counters do not carry these dishes.

It is a sin against the Holy Ghost to say that the profession is over-organized, but such it is. Organization springs from the desire of minorities to live in spite of majorities. As such, organizations give life, shelter and fellowship to the threatened and despised of the world. Their purposes accomplished, they tend toward reaction so

that rarely have they merit after birth, when their powers of leadership because of rightness of cause, are supplanted by the powers of organization to impress their will. What looks like strength is merely a cramp—medically expressed, the cramp of death. Once "successful," Chapman's charge is correct: "All association, business or social, literary or artistic, religious or scientific, is opposed to any disrupting idea." How much in medicine the individual cowers today in the shadows of this mass mediocrity is innocently portrayed in a recent volume on civilization in the United States. Of thirty men who write freely of our politics, art and religion the one who speaks for medicine must, "for obvious reasons," remain anonymous.

This is just a reversed way of saying that the present day doctor has sacrificed his individuality—the thing through which alone he has gained his public standing historically or in the present. Never before has he affected a community through mass action, and it is safe to predict that through such he never—lastingly—will. He enters the public's life through an individual's need of him; and in the crises of life—birth, fear, despair and death. Disease may be objective but its effects are all subjective. Through his understanding of the individual in these circumstances has come the reward of individual trust; and it is this confidence multiplied which constitutes the public esteem in which the doctor lives. To think that such can be built up through massed professional activity is idle.

When will we get a secretary of medicine in the cabinet? Never through a lobby but when some one politically powerful transposes the personal faith he feels in his body physician into political action. We may get him any day that an occupant of the White House trusts adequately the mind and heart of his doctor. This is the manner of men. Not so long ago another follower of the "regular" school asked me why one of our intelligent citizens threw his whole energies into the cause of homœopathy. I ventured the easy answer that his family doctor was homœopathist, and more—that as a man this doctor was no mean personality.

## III.

If the medical profession has problems it is because it has either voluntarily relinquished what it should have held or done badly what others have done better. Each of these headings has subheadings of a legitimate and an illegitimate type. The picture of my old doctor

friend jogging along in his buggy in the hours after midnight, responsive to a charity call registered through a telephone which he had himself installed in the home of his patient is all too rare. I inquired why he had not sent his younger colleague. He answered that he could not ask an assistant to rise in the night and work without material recompense. The young doctors do not nowadays follow the sick poor of our hospitals to their homes. The social service workers do this and the human aspects of the problems of disease are today more commonly touched by the educated nurse than by medicine's new generation. But if these things be so, is it any wonder that the sum total of patients which constitutes our public is becoming increasingly deaf to suggestions which spring from the medical profession and increasingly responsive to those emanating from social uplifters or economic and political reformers?

I venture to add that we do not know enough. For more than a decade now the non-medical psychologists have been able to tell us more of the rank of our mental defectives than we ourselves knew; the graduates of domestic science schools have known more of food values than ninety-nine of a hundred doctors; and laboratory technicians in X-ray work and the simplest biochemical tests have become the interpreters to the profession of the things which it should know itself. If the medical man still feels that *he* is set apart to teach these things, he must be securer in his knowledge of the fundamentals.

From an illegitimate side, the doctor's calling has been placed in parallel with the caricatures and fragments of medical thought represented in Christian Science, osteopathy and chiropractice. There has been much scramble to keep these things in their proper places through the political seesawing of legislative groups inclined to listen at one time to the doctors and at another to the toredoes. The answer should be simple. Why does the doctor ever acknowledge these as competitors? Have they a better knowledge of the principles of medicine and surgery? Or need there be envy that chicane so often pays better than honesty? It will be argued that the public does not know enough and that it must be protected. This has been the cry of autocrats since the stork ruled the frogs. What is at stake is the question of our fundamental faith in democracy. In brutal terms, our average fourteen-year-old intelligence is asked to decide whether it will learn or die. For myself, I have little faith in the moral or mental

merits of a people which in law buttress the one with the virtue of jails and the other by a superimposed intelligence. The superiority of a people is to be measured by its ability to withstand temptation and not by the number of its prohibitory laws which makes a going-wrong impossible; nor is its superiority proclaimed by an absence of quack solutions but by its clearness of intellect which permits it to distinguish these from better ones. Why the forcing of more health laws upon an unwilling humanity? Those who do not believe in vaccination, antitoxins and the purification of water and food supplies might, for a change, be permitted to die. If our Christianity needs to be invoked let us consider St. Luke. As physician and teacher he preached that "Now is salvation come nigh unto you." But with the truth uttered he left his audiences to make the final choice.

The medical profession will increase or lose its public power only as the collective expression of the people's faith in the individual doctors who touch them. To breed such faith the doctor must get again his old courage and cease to be the pussyfooter of our present day. What is wanted is not a strutting vanity, common enough, but a consciousness in the doctor of where he came from and where he is going. To do this he needs to learn again that he is a judge and obligated as such to get at evidence first hand. The profession of medicine is an openhanded one whose discoveries, practice and points of view are free and obtainable for the asking. Let the medical man then choose well whom he will visit and learn from. Let him discover what men actually do and not what others tell him they do. This holds true also for the evidence which he gathers from the printed page. In the hustle of our modern life the medical man has here fallen into the group of the common. He does not read originals any more and hardly reviews. The thing has become so attenuated that in his journals and text-books he is literally consuming reviews of reviews of reviews. As well may a man think to understand the psychology of sheep because he feeds on lamb stew.

The fundamental situation will not be changed in the space of a night. New viewpoints and idealism grow best in young soil. Whence our interest in the education of the new doctor. But medical education like all so-called university education has fallen into bad ways. There have been carried into it the false ideals of the kindergarten and grammar school. Education is conceived of, too much, as something that may be bought for and added to a son. And the present

day university course does cost only four years and four thousand dollars of anybody's money. This idea must change. If there is a fundamental law under which we live it is that of Lamarck. Not through environment but through the degree of reaction on our part to that environment do we develop or atrophy.

But what is there in modern university education which develops the senses to observation, the mind to logic and the soul to understanding? The medical student is today lectured into coma—but the skill we are seeking can be acquired only by doing. Whence will come the man and the institution to teach again by the apprentice system? When will we see again working students emulating masters?

What is so badly started in the universities and medical schools continues in the subsequent professional life. There is an eternal clamor for positions on hospital staffs, on boards of control, on faculties of medicine. As in political parties, groups of doctors are insiders or outsiders. What does it all matter and when will it be learned again that only the man counts and not the circumstance? Staff jobs, faculty places and positions of power are the husks of corn. Men collect jobs like political badges, recognizing in all too few instances that they are nothing but opportunities for work—and who uses them?

A doctor friend told me recently that he felt cramped in a hospital which housed only eight hundred beds. But Boerhaave changed all European medicine with but twelve; Corrigan rewrote the chapter on heart disease with but six and Külz, whose work fills one-third of all the tomes on diabetes, had just two patients. Could any practitioner have less?

## IV.

Our modern medicine is tending in two directions, the one leading toward the ideals of the five-and-ten-cent store and administrative madness. This group talks of "selling" its ideas to the public. The other is recognizing that the collective skill and power and position of the medical group is only a composite of the piled-together abilities of the individual doctor and the reaction evoked from the individual patient. Our time represents a call to return to the fathers. The world is seeking, as of old, doctors with a kindliness, a tolerance and large understanding, the skill of hand, the skill of mind and the

resourcefulness of a past generation. Where are the successors of Van Swieten, John Hunter and Benjamin Rush or, in more modern terms, of Neusser, Osler and Billings? The Greek world sank as it grew in democratic principle—not in the abstract principle of democracy but in the concrete expression of it which substituted for its earlier rulers, proficient in the arts and sciences, the ever increasing number of non-productive Athenian traders. Is the efficiency of modern medical practice riding to a similar fall? Let us be honest with ourselves. If medicine fails it can not be ascribed to our stars, for our time, as all ages before it, in the hour of sickness and death cries as did Jeremiah: "Is there no balm in Gilead; is there no physician there?"

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# SCIENTIFIC AND TECHNICAL ABSTRACTS

Boric Acid as a Preservative for Canned Goods.—In principle the sterilization of foods in the canning process should be sufficient for preserving them for a reasonable time, but in practice, especially in large-scale operation, incomplete sterilization may occur and unwholesome conditions develop. One phenomenon frequently seen in spoiled canned goods is swelling of the container on account of the production of gas. These "swells," as they are called, are sometimes opened by a small perforation which allows the escape of the gas, resealed, relabelled and turned back into the market, but these practises are now probably not common. Many inquiries have been made of the Bureau of Chemistry concerning the use of boric acid as an aid in preservation. In earlier years, salicylic acid was largely used by housekeepers in home canning, though the nature of the substance was not generally known. The legislation against this has necessitated resort to other preservatives, and sodium benzoate and boric acid have been brought into notice. The Bureau of Chemistry has made a careful investigation of the action of boric acid on the organisms commonly associated with spoiled food, and also made analyses of boric acid preparations offerd in the market. The

work was done and the report prepared by Ruth T. Edmondson, Charles Thom and I. T. Giltner. The analyses of the powders were made by J. I. Palmore. They are sold in packages which are apparently intended to contain an ounce, but considerable difference was found in the net boric acid content of the several samples. The directions gave no warning that an excess of the material in the food might be harmful. The experiments are given fully and in detail. The results are mainly that boric acid canning powders, when used in the amount directed, control the growth of certain molds and aerobic micro-organisms, but these are not responsible for spoilage in processed material. The powders had no appreciable affect on the growth of *B. botulinus,* which is a very serious contamination in some foods. The use of the powders is wasteful, since careful processing will fully preserve the materials for a reasonable time. In dealing with the moderately neutral vegetables, the use of the powder with the inadequate heating recommended and likely to be used by the home canner, will not control the growth of the *B. botulinis.*

H. L.

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THE ASSAY OF OPIUM ACCORDING TO THE JAPANESE PHARMACOPEIA.—Dr. Axel Jermstad communicates to the *Schweizerische Apotheker-Zeitung* (1922, 60, 650), a critical study of the method of assaying opium for morphine content, as given in the current edition (iv, 1922) of the Japanese Pharmacopeia, which has modified its process somewhat from that in the previous edition. The process is with lime water, and involves a half hour's agitation of the filtrate after adding ether and ammonium chloride. After separation of the morphine under certain conditions, it is dissolved in a known volume of N/10 hydrochloric acid and the excess of acid determined by titration with alkali, using hematoxylon as indicator. If the sample is very rich in morphine it should be diluted with a poorer quality or with one of the official starches. Jermstad found several objectionable features of the method. The thirty minutes shaking is unnecessary; ten minutes is sufficient. The total time required for the process is about two days, and the indicator is not satisfactory, inasmuch as a distinct color-change is obtainable only with quite fresh material. Comparative tests made with the Japanese process and Jermstad's modification of the Helfenberger method were much to the

disadvantage of the former. In every case the Japanese process gave lower results. It appears, therefore, that in modifying the opium-assay method, the J. P. iv has made anything but improvement over that in J. P. iii.

H. L.

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DETECTION OF HYPOCHLORITES AND CHLORAMINS IN MILK AND CREAM.—These substances being now largely used in dairy work for disinfecting utensils, it is not at all unlikely that they may be added to milk intentionally, or be accidentally introduced. Philip Rupp, Dairy Chemist, Bureau of Animal Industry, has investigated the tests for such substances in market milk, and his results have appeared in a bulletin of the department. For sake of brevity he uses the term "chlorine" for the available chlorine in the compounds. The detection of such chlorine in water is easy, by means of the starch-potassium iodide or ortho-toluidin test, but in dealing with milk there are interferences owing to the union of the chlorine with the proteins. It was found, however, possible to liberate the chlorine so that it will react with potassium iodide. Mixtures of pure milk and cream were made with definite small amounts of hypochlorites and chloramins, and set aside in an ice-box for 48 hours. These were tested for chlorine, allowed to stand for several hours at room temperature, returned to the ice-box for 48 hours and again examined. A flask of pure, untreated milk was employed as a control.

The reagents are:

7 grams of potassium iodide in 100 c. c. of water. This should be fresh.

100 c. c. of concentrated hydrochloric acid are diluted with 200 c. c. of water.

1 gram of starch is boiled 100 c. c. of water and cooled.

Distilled water should be used.

The test is applied as follows:

5 c. c. of the sample are placed in a medium sized test-tube, 1.5 c. c. of the iodide solution added, the mixture shaken and the color carefully noted. If no perceptible color change appears, 4 c. c. of the dilute hydrochloric acid are added and the curd thoroughly stirred with a glass rod flattened at the end. The color is again noted.

The tube is then placed in water at a temperature of 85° C. and allowed to remain ten minutes, the temperature being maintained at the original point. It is then rapidly cooled in water, and again examined for color. Finally, 0.5 to 1 c. c. of the starch solution is added to the liquid below the curd and the reaction noted.

Milk containing 1 part of chlorine to 1000 acquires a distinct reddish tint and at a dilution of 1 to 2500 is still slightly colored as compared with the control. This statement applies to both hypochlorites and chloramins. With 1 part of chlorine to 5000 parts of milk, the liquid acquires a pale yellow on addition of the iodide solution. These data relate to samples not heated during the test. When the heating is applied the delicacy of the reaction is increased, so that 1 part of chlorine in 50,000 parts of samples may be detected. Milk kept in the ice-box for 48 hours still gives the test. When kept at room temperature the delicacy of the test is not so great. Milk pasteurized at 145° F. reacts like raw milk, 20 per cent. cream reacts like milk. It is best to examine carefuly the curd and liquid below it.

H. L.

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Industrial and Laboratory Uses of Carbon Tetrachloride.—In *Boll. Chimico-Farmaceutico* (1922, 641 *et seq.*), G. Giro presents a lengthy paper, extolling the value of carbon tetrachloride as a substitute for several of the common organic solvents, especially ether, and the light coal-tar and petroleum products. The carbon compound has the great advantage of incombustibility, thus eliminating the dangers to life and property that are such serious drawbacks to the use of the other liquids. It has been shown, however, that, in case of fire from other causes, the vapors of the tetrachloride are liable to produce carbon oxychloride (phosgene gas), which is very dangerous to life. Giro does not allude to one objection to the tetrachloride, which is important in operations on the large scale, such as extraction of fats and oils or medicinal principles, namely its high specific gravity, which compels the use of a much greater weight to secure a volume equal to that of the lighter solvents. In figuring, therefore, on the relative cost of gasoline or ether to the carbon compound it must be borne in mind that nearly twice the weight of the latter will have to be taken to get the equivalent volume. This fact has been, indeed, one that has had much influence with manufacturers

who use such solvents. For the laboratory use of the substance the question of cost will not be serious.

Commercial carbon tetrachloride being made by the action of chlorine on carbon disulphide is liable to contain some of the latter and also may contain impurities due to irregular reactions. At present among its common uses are as substitute for gasoline and ether in household cleaning work, and in fire extinguishers. It is in the latter use that the danger of the formation of phosgene has been shown.

Giro claims that for a given weight of the common organic solvents, the tetrachloride requires less heat units in distillation for recovery, and less condensation water, but the practical question, as noted above, is one of volume, and the comparison of ether and the lighter products of petroleum and coal-tar (lighter than water) with the tetrachloride, which has a specific gravity of nearly 1.6, shows that the inference is doubtful.

The author gives numerous examples of its satisfactory use in analytical and experimental work, such as detection of iodine, indican and urinary pigments, and the extraction of certain alkaloids from water solution. He declares that for extraction of strychnine and atropine from viscera, the substance is more satisfactory than other solvents. It is a question, however, whether a high grade chloroform, now easily obtainable, will not serve as well. Specific recommendations of the tetrachloride are made for the extraction of caffeine, theobromine and cholesterol. In 1906, Piutti and Bentivoglio recommended it as a substitute for amyl alcohol in the extraction of certain colors from food articles. In this use one can avoid the disagreeable odor of the amyl compound.

Some space is given to its use in medicine, but it does not seem practical to use it as a solvent in substitution for alcohol or even chloroform. Its use as a direct therapeutic agent in the treatment of certain intestinal parasites is mentioned but that is now widely known. Giro even claims a lower anesthetic power for it as compared with chloroform, but experience years ago when it was first introduced was unfavorable. This may, however, have been due to impurities, and a re-examination of the data with carefully and thoroughly purified material may be of interest and use.

H. L.

RELATION OF pH TO THE ACTIVITY OF MERCURIC CHLORIDE.—Joachimoglu has made some studies on this subject, using a buffer solution as described by Sörensen, with a solution of the mercuric salt 1:600,000. The results are briefly noted in *Pharmaceutische Monatshefte* for October last. Concentrations from pH 7.8 to 9.7 inhibited the antiseptic action markedly, but some effect was noted even at pH 12.1, at which point the hydroxyl ions are in play, which have also an effect on bacterial growth. In concentrations of pH 4.8 to 6.6 strong antiseptic action was observed. It appears, therefore, that in the practical application of mercuric chloride a slight acid reaction should be maintained.

H. L.

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ACETONE IN COMMERCIAL AMMONIA.—Bougault and Gros communicated to the French Pharmacy Society the results of some examinations of commercial ammonia, a summary of which is given in *J. Pharm. Chim.*, 1922, 26, 170. They were led to make the tests on account of having noticed the frequent production of small amounts of iodoform when ammonia solutions were employed in some reactions. Examination of samples from different firms showed the presence of acetone in many cases, the amount ranging from 0.01 gram per 1000 c. c. to 0.50 gram. A sample marked "pure ammonia for analytical use" was found to contain the highest amount. The impurity is specially important since in testing urine for acetone, the use of ammonia is often advised with the iodine to avoid the error from presence of ethyl alcohol. It appears that the occurrence of the impurity is not a matter of recent development. In a communication published by Guérin in the same journal in 1909 it was stated that iodoform could be obtained by the simultaneous action of ammonia and iodine on many organic bodies and even from carbon dioxide. Bougault and Gros describe one of Guérin's experiments in which evidently the production of the iodoform is not due to the reactions he indicated. It appears, therefore, that in making tests for small amounts of acetone, the use of ammonia should be avoided unless the reagent has been carefully tested.

H. L.

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THE GERMAN DYE INDUSTRY.—The leading nations involved against Germany were especially aroused during the war concerning the establishment of plants for manufacturing the synthetic coal-tar

products of which the dyes constitute the most important portion. For many years, Germany had practical control of the output of dyes, a condition due largely to the thorough co-operation of theory practise, but also to ingenious trade arrangements as to domestic distribution and export. The sudden stoppage of the supply became world-wide, for the Allies, of course, discontinued all commercial relations with their enemy, and the British blockade cut off supply to neutral countries. The several nations thus deprived, proceeded to establish industries, and after much difficulty and not a few failures, some of them have succeeded in producing many dyes and other synthetic tar products equal to those formerly manufactured only beyond the Rhine. Two methods have been employed as financial aids to these industries; embargo on importation and high duty. Shortly after the armistice, an embargo was placed by the United States Government on all dyes, except such as were not obtainable at reasonable price and satisfactory quality in the domestic market. This embargo has now been succeded by the Tariff Act lately approved. The *Commerce Monthly* for December (issued by the National Bank of Commerce, New York) gives figures for the imports and domestic production of dyes, in pre-war and post-war years.

In 1914 the United States produced about six and one-half million pounds and imported nearly forty-six million pounds; in 1921, the figures are: domestic production, forty million pounds; importations somewhat less than four millions. In 1920, the domestic production was more than double that of 1921, but the result was large excess stock, which, together with the industrial depression, caused a material falling off in manufacture. It seems from the data at hand that the three great nations that were at war with Germany have succeeded in establishing satisfactory methods of making the more important dyes, but that these industries are still "infants" in the economic sense, and can only be maintained against German competition by embargo or tariff. Italy has employed the embargo method to prevent competition, but it has been for many years under German influence. The advertisements in Italian trade and scientific journals show that a very active propaganda is being carried on by German firms, and it will not be surprising if this newly developed industry is upset.

The problem is still more complicated by the fact there are large areas in which no such industry has been established, occupied by

dense population who have demands for large amounts of dyes. Recent statistics show that Germany is now furnishing to China, Japan, Czecho-Slovakia, the Baltic States, and Austria large amounts of dyes. Germany's opportunities in some markets are materially increased by the monetary conditions. Since Germany's exchange is more nearly to the level of the exchanges of the markets of the Far East, the German manufacturer has an advantage over those in countries in which exchange is nearer par. All the data that come to us from Germany indicate that the Allied and Associated Powers have "scotched the snake, not killed it."

H. L.

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# MEDICAL AND PHARMACEUTICAL NOTES

PRESERVATION OF SALIVARY AMYLASE BY GLYCERIN.—E. Doumer has found that glycerinated saliva retains its amylolytic properties for a long time. After twenty-eight months his specimens were as active as when prepared. — *Journal de pharmacie et de chemie.*

W. H. G.

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ASPIRIN—AN URINARY ANTISEPTIC.—It is stated by P. Gallois that aspirin in doses of 1 gm. 50 to 2 gm. per day is as active as hexamethyline tetramine for clearing the urine. Some boric acid can be profitably added. —*Journal de pharmacie et de chemie.*

W. H. G.

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CHANGES IN THE REACTION OF SOFT WATER THROUGH THE ACTION OF AQUATIC PLANTS.—Water, drawn from a tap had a slightly alkaline reaction. Some living green plants were placed therein. In the dark, the alkalinity fell and passed the neutral point; in the light the alkalinity increased and even more so in sunlight. When placed again in the dark the alkalinity diminished.—*Journal de pharmacie et de chemie.*

W. H. G.

The Toxicity of Metallic Powders.—V. Ariola has studied the toxicity of several metallic powders—very pure and in an extreme state of pulverization—which he introduced under the skin of frogs. The powders experimented with produced paralysis, followed by death. Amongst those studied, antimony was the most toxic, followed decreasingly by copper, cobalt and iron. The metals acted by forming metallic albuminates. The toxicity of the oxides of copper, cobalt and iron is more feeble than that of the respective metals.—*Bull. des Sci. Pharmacolog.*

W. H. G.

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The Taamya.—The bean is the principal food of the native Egyptian—its high nutritive power permits prolonged and intense muscular effort. Beans are eaten in various ways—one of the principal forms is the "*taamya*"—which is prepared in the following manner: The beans are put to soak for twenty-four hours, producing a slight germination, then the skins are removed; the beans are well beaten in a mortar and mixed with some coriander, some garlic, onion, Cayenne pepper, parsley and leeks. When the mass is thoroughly mixed it is formed into flattened balls and fried in oil of sesame to a chestnut brown. The result is the "*taamya,*" which, with bread, forms the chief meal of the Egyptian laborer.—*Bull. des Sci. Pharmacolog.*

W. H. G.

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Note on Ampuls of Amyl Nitrite.—The attention of pharmacists has been called to the explosive properties of these ampuls after they have acquired a certain age.

On account of this, some manufacturers have taken the precaution of placing them in a small sack to prevent such accidents.

Quite recently a French pharmacist, suffering from a severe attack of asthma, secured great relief from inhalations of this drug; he subsequently recommended this medication to one of his friends. This lady, wishing to follow the advice given her, purchased some ampuls of amyl nitrite; at the first trial, just as she was about to make a scratch on the end of the ampul, an explosion occurred, particles of glass flew into one of her eyes, and destroyed it. It seems proper to advise pharmacists to caution their customers, never to

break these ampuls near the eyes, and to cover them when breaking with a cloth.

It would be desirable if makers of ampuls of amyl nitrite would cover them with cloth or other material in order to prevent particles of glass from flying about when broken.

The accident referred to did not cause a suit against the pharmacist on account of the friendly relations existing; but under other circumstances the pharmacist would certainly have been forced to defend a suit for damages, hence this warning.—*Répertoire de pharmacie.*

W. H. G.

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THE VALUE OF SOME COMMERCIAL VITAMIN PREPARATIONS.—The discoveries in regard to substances existing in foods, upon which important nutritive values depend, have opened very interesting and complicated lines of investigation in dietetics. Owing to the minute amounts commonly present and the fact that as yet they have not been distinctly isolated, the tests for their presence depend practically upon experiments on lower animals, and it has been found that some of the smaller animals are satisfactory for such purposes. The results obtained in the laboratory have been, of course, promptly extended in application to the human being, and a new series of data for determining the character and nature of diet has been arranged. Naturally, advantage has been taken of the public interest in the matter to exploit a great many preparations under claims of specific content of one or more of the vitamins. Vitamin B, a water-soluble form, exists in notable amount in yeasts, and the organisms commonly found in brewer's yeast are conveniently taken as a standard. On this basis, E. M. Bailey, assisted by Helen J. Cannon and H. J. Fisher at the Connecticut Agricultural Experiment Station have made an extended examination of proprietary preparations found in the American market, for which claims of high content of vitamin B are made. The comparisons were made with equal weights (100 mg. of dry brewer's yeast and of the sample). Many of the preparations, it is true, do not make definite claims as to the amount of this vitamin present, but the investigators have justly assumed that any sample that does not show a nutritive value equal to the standard yeast, cannot be considered as entitled to claim a superior therapeutic value as a source of vitamin B. In order not to complicate the investigation

no attempt was made to value the content of vitamins A and C in the samples examined. Moisture determinations were made on all samples, but it was found that with the exception of two, the moisture content was so small that it was not deemed necessary to allow for it, and the material was fed as purchased. Twenty samples were tested. Their trade names, label claims, general characters and important analytical data are given. Charts are also given showing the results with the experimental animals. The trade names ring the changes on English, Latin and Greek terms. Of the twenty samples, four gave entirely satisfactory results, six were fairly satisfactory and nine were of inferior value. Of the latter some were quite inefficient. In one case the label claimed the presence of "water-soluble A" and "fat-soluble B," which indicates that the text was written by a professional advertising agent, and not by the pharmaceutical chemist who is presumably in the manufacturer's employ.

It will be seen that only one-quarter of the samples tested have good value for the purposes for which they are recommended. This is the drawback to the wide circulation of scientific data, because the public at once becomes the victim of charlatans and frauds. In the case of vitamin preparations the evil is especially serious, since up to the present time, these can only be tested by a tedious and expensive method of animal experimentation. In some cases, such as diabetic foods, comparatively simple methods of chemical analysis will settle the points as to dietetic value. It will, moreover, be necessary to maintain constant control over these products, as new ones will be offered from time to time, and those already in the market may be changed in composition. It is also an important question how long the efficiency of the vitamin is retained. It may be a necessary supervision to require the date of manufacture to be placed conspicuously on the package, and to fix a limit of age, beyond which the material is unsalable. This method is followed in photographic supplies, and it seems that the human being is entitled to as much protection from worn-out goods as the photographer in his business.

After all, it is a serious question how far the many preparations are of value to the growing child or to the invalid, for it is only for these that the regular use of such preparations can be recommended. The spectacle of an adult man or woman, in fair physical condition swallowing yeast preparations, when good wholesome and palatable food is available is not commendable. The extensive researches that have

been made into the distribution of vitamins in food, have shown, as stated in report in hand, that there is no danger of any vitamin deficiency in the average mixed diet of normal individuals. By energetic advertisement, the public at large has been led to believe that almost all persons need specific vitamin diets. No doubt physicians have been misled into encouraging such ideas, but a strict governmental supervision should be promptly established to check up the claims of all such preparations and deal drastically with those that are inefficient. The fact that the Connecticut investigation showed that almost half the samples were practically inert and only one-fourth up to a reasonable standard, gives one a very unfavorable view of the business honor among manufacturers of foods and drugs, but it did indeed not need the data of this report to show us that. Some day, a chemist who has been long occupied with food and drug analysis may write a book entitled "Rambles in a Therapeutic Graveyard," and he will tell of the epitaphs upon many articles which have strutted and fretted their hour upon the stage, then to be heard no more.

H. L.

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# NEWS ITEMS AND PERSONAL NOTES

Death Claims William Ashlin Musson.—William Ashlin Musson died of pneumonia in Philadelphia, December 16, 1922.

He was over ninety years old and was an apothecary in Quebec and Montreal, Canada, and Philadelphia for over sixty years.

He received his pharmaceutical education at the University of McGill College, Canada, in 1849-1852. He was for many years a member of the Philadelphia College of Pharmacy and Science.

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Poultryman's Calendar and Egg Record for 1923.—Merck & Co. distribute this calendar among chicken raisers, both professionals and amateurs, who find it very convenient for keeping tabs on the daily egg yield.

Quite a number of druggists write for copies each year to dis-

tribute among local poultrymen. They need many articles which the drug-store can supply, and the calendar helps to cultivate this trade.

If you can use a few copies to advantage, please write promptly to Merck & Co., 45 Park Place, New York.

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New York Veteran Druggists' Association.—Advocated by Wilhelm Bodemann, the philosopher of the "Windy City," and engineered by Prof. H. Vin Arny, the hustler of Gotham, there was born on Tuesday, January 9, the New York Veteran Druggists' Association. Prof. Arny issued a call and about twenty-five "Veterans" in retail, wholesale and manufacturing pharmacy, teachers and journalists, assembled to a luncheon at the Chemists' Club, New York City.

Requirements for membership were settled at: Age over fifty years and drug experience at least twenty-five years. The following officers were elected:

Honorary members—Wilhelm Bodemann, Prof. Chas. F. Chandler and F. B. Hays. Honorary President, Thos. D. McElhenie.

President—Prof. H. V. Arny.

Vice-President—Benj. T. Fairchild.

Secretary—Robt. S. Lehman.

Treasurer—J. Leon Lascoff.

Executive Committee—Horatio Fraser and Prof. Otto Raubenheimer.

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# BOOK REVIEWS

Eating Vitamines. By C. Houston Goudiss. 98 pp., 7 full page illustrations. $1.00. Funk & Wagnalls Co., New York and London.

Of technical works concerning the subject of the food accessories called vitamines there has been an abundant supply. The layman, however, who is the one most to be benefitted by a broader and more complete knowledge concerning nutrition, has been given very little consideration.

Here is a book which meets this present and important need. As stated on the title page, it concerns itself with "How to know and prepare the foods that supply these invisible life guards, with two hundred tested recipes and menus for use in the home."

The book is a small volume of less than 100 pages and is almost as concentrated as the vitamines of which it treats.

Thirty pages are concerned with a very brief but lucid explanation of the salient facts regarding the vitamines.

Then follow ten pages of a chapter called "Who's Where in Vitamines," in which the four varieties are tabulated and cross indexed so that one can quickly ascertain what food to eat to get a certain vitamine, or what vitamines are present in any one of more than one hundred varieties of foodstuffs which are alphabetically arranged. A chapter of forty-four pages of recipes for preparing foods rich in vitamines then follows, and, finally, a chapter containing typical menus for luncheons and dinners for the four seasons.

These last two chapters contain information not available in any other book that has thus far been published.

The book is an excellent one, filling a long-felt want. It is hoped that a larger and revised edition may be forthcoming later, in which several pertinent questions may be discussed which are missing in this volume, among which may be mentioned the vitamine content of desiccated and dehydrated foods, and the effect of cooking upon the vitamine content of prepared foods.

Only one error was noted. Watercress is shown in the illustration of foods rich in vitamine C, but it does not appear in the alphabetical list of foods in Chapter 5.

C. H. L.

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PHARMACEUTICAL AND FOOD ANALYSIS. By Azor Thurston. 409 pp. and Index. $4.50. D. Van Nostrand Co., New York.

This is a posthumous work by a worker of fine ideals and enviable reputation as a food and drug chemist for many years associated with the work of the Ohio State Pure Food and Drug Commission. The publishers were assisted in the final preparation of the work by his friend, B. L. Murray, well known as chief chemist of Merck & Co., Rahway, N. J.

It is described as "a manual of standard methods for the analysis of oils, fats and waxes and substances in which they exist; together with allied products."

This description is too modest in its claims for nearly half the book is devoted to products which would hardly be called "allied" and yet which combine to make the work of unique scope and value.

Three preliminary chapters are devoted to Polarimetry, Refractometry and Specific Gravity. A chapter then follows on General Methods of Analysis. The four succeeding chapters, or real working portion of the book, are concerned with Oils, Fats and Waxes; Flesh Foods; Eggs and Egg Substitutes, and Volatile Oils.

The preliminary chapters might well have been spared for they are too brief to be of real value.

The unusual feature of the work is the generous bibliography, which follows each subheading. Under linseed oil, for example, there are forty references to articles which have appeared during the past twenty years in a list of ten important chemical and pharmaceutical periodicals.

The book is not a general manual of food analysis like the works of Leach or Leffmann & Beam, nor a complete work on drug analysis like those of Parry or Fuller, but it will doubtless find a place in every analytical laboratory or reference library for it contains many things which have not found their way into textbooks or working manuals but which must usually be sought for in the literature.

The book is not free from criticism in all respects. The statement on page 162 that "Winton has shown that ground cocoanut shells are frequently used in the adulteration of spices" was true when it was made over twenty years ago, but is hardly appropriate now. On page 298 laurel oil is erroneously classed with volatile oils obtained by expression. On page 106 the section on cod liver oil is very much out of date as no mention is made of the presence of vitamines.

One wonders why Krystalak and Cremora, which are milk products, should appear in the chapter on egg substitutes rather than where they properly belong.

Typographically the book is excellent.

It will doubtless find many users in spite of its limited scope.

C. H. L.

The firm of Gustav Fischer, of Jena, well known as publishers of pharmaceutical and medical works, favored us with the following two books for review:

GESCHICHTE DER MEDIZIN IM ÜBERBLICK MIT ABBILDUNGEN (Illustrated Short History of Medicine). By Theodor Meyer-Steineg and Karl Sudhoff. 2d edition, 442 pp. and 216 illustrations.

Both authors are authorities on the subject of history of medicine. Theodor Meyer-Steineg holds this chair at the University of Jena and Karl Sudhoff at the University of Leipzig. The work is divided as follows:

I. Medicine of the classic ages to Galen, by Meyer-Steineg.

II. From Galen to Bacon of Verulam, by Sudhoff.

III. From Harvey to the present time, by Meyer-Steineg.

There are a number of large works on the history of medicine, but a single book on this subject, covering the entire field, has been in demand. The standing of both authors assured a work of merit, which was fully realized. That within less than two years the publication of a second edition became necessary proves the necessity of such a work, which should also become better known on this side of the "great pond." The many illustrations are a distinct advantage for which the publishers deserve thanks. Paper and printing are of excellent quality.

From the earliest times medicine and pharmacy had the same object, namely, to prescribe and furnish medicine for the sick. The present volume contains much matter which the pharmacist who loves his profession should know. It is for this reason that we can cheerfully recommend the book to all those interested in this subject.

RUDOLF VIRCHOW. By Prof. Dr. Rudolf Beneke. 55 pp.

October 13, 1921, marked the centenary of the birth of Rudolf Ludwig Karl Virchow, the famous German pathologist, anthropologist and archeologist. The monograph before us was written in memory of that day. It is a very complete biography, especially as it contains S. S. bibliographic notes.

The founder of cellular pathology (1858) is now dead, but his aphorism, *"Omnis cellula e cellula,"* will continue to live. To Virchow we owe our conception of disease and American medicine owes

much to those who were under Virchow's tutelage in the last three decades of the nineteenth century.

All those interested in the great pathologist should read this excellent monograph.

OTTO RAUBENHEIMER, Ph. M.

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One of the large German publishing syndicates, the Vereinigung Wissenschaftlicher Verleger, Berlin and Leigzig, issue the *Sammlung Göschen*, a library of pocket size. These volumes contain a fund of knowledge and are quite inexpensive, about 30 cents each. The following books have been submitted for review:

PHARMAZEUTISCHE CHEMIE. By Prof. Dr. E. Mannheim, Privatdozent für Pharmazeutische Chemie an der Universitat Bonn, in 4 volumes. No. 543 Anorganische Chemie, No. 544 Organische Chemie, No. 588 Methoden der Arzneimittelprüfung and No. 682 Übungspräparate.

The first two volumes treat in the usual manner, inorganic and organic chemistry, special attention being given to pharmaceutical chemicals. The third volume is devoted to pharmaceutical analysis. The physical methods include Sp. Gr., M. Pt., Cong. Pt., B. Pt., optical rotation and solubility. The chemical methods are divided into qualitative and quantitative analysis, the latter being subdivided into gravimetric and volumetric assays. The fourth volume, "Übungspräparate" includes the preparation of such pharmaceuticals and chemicals as Acidum Benzoicum, Chininum Tannicum, Extractum Opii, Liquor Alumini Acetici, Sapo Medicatus, Spiritus Aetheris Nitrosi, Tartarus Stibiatus, etc.

GESCHICHTE DER CHEMIE. By Prof. Dr. Hugo Bauer, Prof. an der Technischen Hochschule in Stuttgart, in 2 volumes.

Volume I (No. 264) treats the history of chemistry from olden times up to Lavoisier, subdivided into Chemistry of the Ancients, Age of Alchemy, Age of Iatrochemistry and History of the Phlogiston Period. Volume II (No. 265) contains the history of chemistry from Lavoisier up to the present time and is divided into three parts: Age of Lavoisier (1774-1828), Development of Organic Chemistry (1828-1886), and History of Chemistry in Recent Years.

Prof. Bauer has laid down the history of chemistry in as brief an outline as possible, *i. e.*, 244 pages. Let us hope that that these two small volumes will arouse more interest in the much neglected subject history of chemistry, including also some history of pharmacy.

GESCHICHTE DER MEDIZIN. By Dr. med. et phil. Paul Diepgen, Priatdozent für Geschichte der Medizin in Freiburg, i. B., in 3 volumes.

Volume I (No. 679) contains the History of Medicine in Ancient Times, in the Orient, Greece and Rome; Volume II (No. 745), in the Middle Age, and Volume III (No. 786), in the New Age from Andreas Vesalius (1543) up to Virchow's Cellular Pathology (1858).

Dr. Diepgen herewith presents a pocket edition of History of Medicine which should also be of great interest to pharmacists, as pharmacy is the hand-maiden to medicine.

OTTO RAUBENHEIMER, Ph. M.

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Among the German chemical-technical books the library of the well-known publisher, A. Hartleben, Wien and Leipzig, ranks foremost. Up to date 370 volumes have been published. The following recent publications in handy duodecimo volumes have been received for review:

DIE TINTEN-FABRIKATION (The Manufacture of Inks). 7th edition, 224 pp.

That seven editions of this book have been published within four decades is a proof of the great utility of this work. Written by a chemist and manufacturer, Sigmund Lehner, it is a practical book in a popular style. In twenty-five chapters all kinds of ink are described, from the ordinary, old-fashioned nut-gall and iron inks to aniline inks, printers', typewriter and even sympathetic inks and also wash-blueing. Practical working formulas are given, which, when followed, will result in a good product. Six illustrations help to clarify the text. Illustration No. 5, Kolierrahmen or a wooden straining frame, a home-made arrangement, is an appliance which can be used to good advantage in manufacturing pharmacy for straining liquids as syrups or other heavy liquids.

SCHREIB, KOPIER UND ANDERE TINTEN (Writing, Copying and Other Inks). By Louis Edgar Andés. 2d edition, 223 pp.

The old-fashioned haphazard manufacture of inks is a thing of the past. The modern manufacture is based upon distinct scientific principles and chemical knowledge is required. The author treats in the present revised second edition all kinds of inks from a physical and chemical standpoint. It is a distinct credit to both author and publisher that chapters on the chemistry of inks and their chemical examination are included.

The old and ordinary subject of ink is treated in a modern, up-to-date, chemical manner. For this reason we can heartily recommend these books.

OTTO RAUBENHEIMER, Ph. M.

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THE WONDER BOOK OF CHEMISTRY. By Jean Henri Fabre. Translated from the French by Florence Constable Bicknell. Octavo, 385 pp. Illustrated. Cloth, $2.50. New York, The Century Co., 1922.

The infallible delightfulness of Fabre's writings is sustained in this difficult task of making a book of elementary chemistry interesting to the point of being exciting. He has made the wonders of the physical world, its composition, combinations, mutations, a storybook that every active-minded child will receive with enthusiasm and count as one of the great initiations of his life. And, as he always does in his classics for young people, the great French scientist provides in easily understood language a great deal of authoritative information which grown-ups will be glad to have.

Two little boys—the same that Uncle Paul teaches the wonders of "Animal Life in Field and Garden," and to whom he tells the tales of "The Storybook of Science"—are his pupils in simple, informal talks on chemistry, and, as usual, Fabre has made the device effective and charming.

Uncle Paul proceeds by allowing the boys to discover and reason out such steps as they can, a method which not only gives human interest to the young reader but also forces him to use his own powers of reasoning. It is, however, to be regretted that the book lacks an index, which would be a great improvement.

Altogether this is one of those rare books which should be a permanent and a primary classic for young people—and a book not to be scorned by grown-ups.

OTTO RAUBENHEIMER, Ph. M.

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THE PRINCIPLES OF ORGANIC CHEMISTRY. By James F. Norris, Professor of Organic Chemistry, Massachusetts Institute of Technology, etc. 2d edition, revised and enlarged. Octavo, 631 pp., illustrated. Cloth, $3. McGraw-Hill Book Co., Inc., New York City, 1922.

This book, another one of the International Chemical Series, originated by the publishers, is the outcome of a number of years' experience in teaching by an authority on organic chemistry. The new edition of this standard college text covers the recent developments in organic chemistry on both the theoretical and practical sides of the subject. The utilization in industrial organic chemistry of reactions which were formerly of theoretical interest only and the application of newer methods such as those of catalysis and electro-chemistry are fuly described. The treatment of aromatic compounds has been broadened, and brief descriptions of the most important intermediates and of the sulphur and vat dyes are also included. The consideration of the chemistry of fats, carbohydrates and proteins has been extended to include the physiological aspects of the subject.

Problems are given at the end of most of the chapters. These are not merely "quiz" questions on the text, but their solution involves, in most cases, a careful study of the principles discussed and their intelligent application. The solution of problems such as those given is of the greatest value to the student.

Professors and students in colleges of pharmacy will also find this text of great service.

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